THE CHEMICAL FORMULARY

A CONDENSED COLLECTION OF VALUABLE, TIMELY, PRACTICAL FORMULAE FOR MAKING THOUSANDS OF PRODUCTS IN ALL FIELDS OF INDUSTRY

VOLUME III

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PREFACE TO VOLUME II

The gratifying reception accorded Volume I of the Chemical Formulary together with the helpful and constructive criticisms received from reviewers and chemists have manifestly proved the need for a book of this type covering modern formulation in commercial chemistry.

While Volume I is complete in itself, the Editors felt it was impossible within the scope of one book to include all the formulae compiled for the numerous subject headings in the book. Volume II therefore is not a duplication or revision of Volume I but an entirely new work giving further formulae on the subjects treated in the first volume as well as more detailed information on processes and fundamental principles involved.

It will be noticed that all patented formulae have the patent number included. A helpful article on what is patentable in chemical compounding: infringements, licensing, etc., is another important addition to the book. It must be borne in mind in this connection that patented formulae cannot be used in the manufacture of commercial products unless prior arrangements have been made with the patentee.

The Editorial Board has been considerably enlarged and consequently it has been possible to include formulae hitherto unavailable.

A certain amount of criticism was directed toward the use of trade-names in Volume I. It was contended by the critics that formulae containing trade-names should be eliminated regardless of their value. Considerable thought was given to this contention and it was felt that, inasmuch as chemical trade-name products are being used in an ever-increasing number of formulae in every class of chemical manufacturing, these formulae should be included unless the application was exceptionally limited.

A second subject of criticism was the non-uniformity of systems of weights and measures used in the book. Since there is no uniformity in such systems in commercial practice and since the main purpose of the book is to familiarize the reader with commercial practice it was thought best not to attempt to standardize these systems.

In the Preface to Volume I, it was emphasized that the chemistry taught in schools and colleges is rightly confined to synthesis, analysis and engineering whereas in commercial manufacture many of the products so made are not synthetic or definite chemical materials but consist of mixtures, blends or highly complex compounds.

Because of the paucity or antiquity of the literature in this field and because of the difficulty encountered even by experienced chemists on entering new fields a definite need has existed for a modern compilation of formulae for chemical compounding and treatment.

In addition to an Editorial Board composed of chemists and engineers in many industries, publications, laboratories, manufacturers and individuals have been consulted to obtain the latest and best information in the numerous fields covered in the book.

It is important to remember that repeated experiments may be necessary to get the best results, especially when the field is intricate or unfamiliar. Again, although many of the formulae are being used commercially, some of them have been taken from patent specifications and the literature. Since these sources are subject to various errors and omissions, due regard must be given to this factor.

Formulae must be considered chiefly as starting points, variations have to be made to meet individual requirements and specifications. In cases of doubt or difficulty it is advisable at all times to consult other chemists or technical workers familiar with the particular field. This applies particularly in the case of the layman, as while a certain expense is involved this is more than compensated for by the saving of time, money and material.

As mentioned in Volume I it is hoped that those who have found a work of this kind helpful, will bring to our attention any errors they come across and will feel free at all times to make any constructive criticisms or suggestions.

PREFACE TO VOLUME III

Because of an insistent demand for new and additional formulae Volume III of the Chemical Formulary is being published a year in advance of original plans. In technical chemical compounding there is no rest or "breathing-spell"—no "status quo." Improvements are being made daily and new ideas and methods are continually being initiated and applied. New sources of data in many fields are being opened up in order to increase the breadth and scope of information.

As far as possible there has been included information especially requested by users of Volumes I and II. Diligent cooperation on the part of many chemists, engineers, teachers, technicians and other workers has made this possible.

The editor-in-chief wishes to thank all those who have helped in this work, which, in so short a time, has found a place as a highly useful tool and time-saver at the right hand of so many technical workers. In many cases it has proved to be a veritable catalyst in stimulating new products and processes.

Any thoughts for improving succeeding volumes and any new formulae or data, will, as heretofore, be most welcome. To make reference more easy the index in this volume is inclusive of Volumes I, II and III so that three separate indices need not be consulted.

H. BENNETT

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ABBREVIATIONS

amp.	ampere
avoir.	avoirdupois
b.p.	boiling point
Bé.	Baumé
C.	Centigrade
cc.	cubic centimeter
c.d.	current density
c.p.	chemically pure
cu. in.	cubic inch
cu. ft.	cubic foot
d.	density
dil.	dilute
dr.	dram
F.	Fahrenheit
f.f.c.	free from chlorine
f.f.p.a.	free from prussic acid
fl. dr.	fluid dram
fl. oz.	fluid ounce
g.	gram
gr.	grain
hr.	hour
kg.	kilogram
l.	liter
m.p.	melting point
min.	minute
min.	minims
N	Normal
pH	Hydrogen-Ion Concentration
Q. S.	A quantity sufficient to make
r.p.m.	revolutions per minute
sec.	second
Sp. G.	specific gravity
Sq. dm.	square decimeter
U.S.P.	U. S. Pharmacopeia
V.	voltage
wt.	weight

ADHESIVES

White Glue

A solution consisting of:

Animal Glue	100 oz.
Zinc Oxide	50 oz.
Water	100 oz.

gives a glue which sets quite hard and is very strong.

Glue

Urea	1 lb.
Casein	2 lb.
Hydrate of Lime	¼ lb.

Black Albumen from Blood

Let slaughterhouse-blood stand in shallow dishes or pans, cut the blood jelly, sift the serum off. The residue is stirred in water to a paste, and put *through a filter press.* Evaporation in vacuum produces from the second filtrate the dark black albumen used for veneering and laminating.

"Salamyn-Plant" Glue

a. Potato-Starch	35 kg.
Water (35° C.)	105 l.
b. Caustic Soda (35° Bé.)	15 kg.
c. Hydrochloric Acid	about 10 kg.
Water	10 l.
d. Upholsterer's Glue	260 kg.

Stir *a* for ¾ hour after adding *d.* Stir with *b* until glassy, then add *c.*

Calcium Saccharate Glue

Water, Boiling	70 g.
Sugar	6 g.
Lime, Fresh Slaked	1.5 g.

Let stand, stir often, cover. After a few days pour off from bottom deposit, and soak in the solution,

Carpenter's Glue	60 g.

then warm to solution.

Marine Linoleum Cement

Decks to be covered with linoleum should be thoroughly cleaned, and the linoleum stuck to the deck with the following adhesive:

To make 10 gallons, first cut 4 oz. of crude (ham) rubber into small lumps and dissolve in 4½ gallons of gasoline. It will require about two days to get the rubber into colloidal solution. When in proper condition it should string about two inches thumb and forefinger. Cut 19 lb. of gum shellac in 34 lb. of denatured (or wood) alcohol. Add 62 lb. of whiting then add the rubber solution. For best results this mixture should be ground in an iron or pebble mill.

Linoleum Glue

a. Rye or Barley Flour	50 kg.
Water, tepid	250 l.
b. Caustic Soda (20° Bé.)	20 kg.
c. Turpentine, Venice, melted	20–25 kg.

Part *a* dispersed by stirrer is mixed with *b* (dissolved). The mixture is then boiled, and after cooling emulsified by adding *c* (while stirring add).

Painters' Glue (Cold)

Water (25° C.)	350 l.
Potato-Starch, Powder	100 kg.
Rosin, Finely Ground	21 kg.
Caustic Soda (24° Bé.)	56 kg.

Mix altogether with strong stirring for 2–3 hours, let stand 1 hour, and neutralize with dilute nitric acid until red color with phenolphthalein disappears (in a sample). Stir ½ hour more.

Wall Size

Aluminum Stearate	4 oz.
Turpentine	25 oz.
Mineral Spirits (150–190° C.)	71 oz.

Heat the turpentine to 180° F. and add the stearate slowly while stirring continuously. Add mineral spirits and stir until clear.

Painters' Size

Potato-Starch (Air-Dried)	7.8 g.
Calcium Chloride	7.0 g.
Water	3.0 g.

The aqueous paste, when compact, is dried and ground. The excess chloride can be extracted with aqueous alcohol, yielding a better paintable and quicker drying product.

Paperhanger's Paste

Use a cheap grade of rye or wheat flour, mix thoroughly with cold water to about the consistency of dough or a little thinner, being careful to remove all lumps. Stir in a tablespoonful of powdered alum to a quart of flour, then pour in boiling water, stirring rapidly until the flour is thoroughly cooked. Let this cool before using and thin with cold water.

Venetian Paste

a.	White or Fish Glue	4 oz.
	Cold Water	8 oz.
b.	Venice Turpentine	2 fl. oz.
c.	Rye Flour	1 lb.
	Cold Water	16 fl. oz.
d.	Boiling Water	64 fl. oz.

Soak the 4 oz. of glue in the cold water for 4 hours. Dissolve on a water-bath (glue-pot) and while hot stir in the Venice turpentine. Make up *c* into a batter free from lumps and pour into *d*. Stir briskly, and finally add the glue solution. This makes a very strong paste, and it will adhere to a painted surface, owing to the Venice turpentine in its composition.

Flour Paste

a.	Wheat Flour	2 lb.
	Cold Water (1 quart)	32 fl. oz.
b.	Alum	1 oz.
	Hot Water	4 fl. oz.
c.	Boiling Water	96 fl. oz.

Work the wheat flour into a batter free from lumps with the cold water. Dissolve the alum as designated in *b*. Now stir in *a* and *c* and, if necessary, continue boiling until the paste thickens into a semi-transparent mucilage, after which stir in the solution *b*. This makes a very fine paste for wallpaper.

Sinclair's Glue

Formula No. 1

"Very Good" Glue or Gelatin	50 oz.
Water	100 oz.
Glycerin	4 or 6 oz.
Thymol or Menthol	0.15 oz.

The smaller amount of glycerin is for summer or tropical use, and the larger amount for winter. Gelatin is preferable, for commercial glue varies in quality and generally requires neutralizing to litmus with weak alkali. The following is a simple test for a "very good" glue. "On soaking glue in excess of cold water overnight, a gelatinous *coherent* mass is obtained, weighing, when drained, at least four times the weight of the original glue." With the very best glue a mass weighing five times the original weight is obtained.

No. 2

Isinglass	50 oz.
Gelatin	50 oz.
Water	200 oz.
Tannic Acid	12 oz.
Glycerin	8 or more oz.
Menthol or Thymol	0.15 oz.

This forms a stronger adhesive, is perhaps more elastic, and has the advantage of somewhat hardening the skin so that the tendency to blistering is almost completely eliminated.

Marine Glue

Rubber	100 g.
Turpentine	600 g.
Coal Tar Oil	600 g.
Shellac	300 g.

Warm together and mix till smooth.

Preserving Glue

Add 3 ounces of ordinary borax to each gallon of glue or add 1 ounce of formaldehyde to the gallon or 1 ounce of carbolic acid. Adding ½ ounce of 28% acetic acid to 2 pounds of glue will also prevent the souring and also has a tendency to make it waterproof.

Casein Glue

Formula No. 1

Casein	100 oz.
Water	220 to 230 oz.
Hydrated Lime	20 to 30 oz.
Water	100 oz.
Silicate of Soda	70 oz.
Copper Chloride	2 to 3 oz.
Water	30 to 50 oz.

The 220 to 230 parts of water added to the casein is approximately the right amount to use with Argentine (naturally soured) casein; but if a different casein is used the water requirement will lie somewhere between 150 and 250 parts by weight. The correct amount for different caseins must be determined by trial.

The formula presupposes that a high calcium lime will be used. A lime of lower grade may be used, but a proportionately larger amount of it will be needed, or the water resistance of the glue will be sacrificed. It is suggested that for the first trial the user try 25 parts of lime. If this does not give

proper results the amount can be varied within the limits specified.

The density of the silicate of soda used should be about 40° Baumé, with a silica-soda ratio of from 3 to 3.25.

Copper sulphate can be substituted for copper chloride.

Place the casein and water in the bowl of a mixing machine and rotate the paddle slowly, stirring the mixture until all the water has been absorbed and all the casein moistened. If the casein is allowed to soak beforehand it is more readily dissolved in the mixing process. Mix the hydrated lime with water in a separate container. Stir this mixture vigorously at first, but just before it is added to the casein stir just enough with a gentle rotary motion to keep the lime in suspension. Pour the milk of lime quickly into the casein.

When casein and lime are first combined they form large, slimy lumps, which are balls of dry casein coated with partly dissolved casein. These break up rapidly, becoming smaller and smaller, and finally disappear. The solution, in the meantime, is becoming thin and fluid. At this point stop the paddle and scrape the sides and bottom of the container, and then stir again. If a deposit of casein remains unacted on, it may cause more lumps later.

When about two minutes have elapsed since the lime and casein were united, it may be noticed that the glue has begun to thicken a little. Add the sodium silicate now, or else the glue will become too thick. The glue will momentarily become even thicker, but this thickness will soon change to a smooth and fluid consistency.

Continue the stirring until the glue is free from lumps. This should not take more than 15 or 20 minutes from the time the lime was added. If the glue is a little too thick, add a small amount of water. If the glue is too thin, it will be necessary to start over again, using a smaller proportion of water.

The copper salt may be added at any one of several times during the mixing process. If added as a powder before the casein is soaked, it may have a corrosive action upon the metal container. The copper salt, if added as a powder, should be thoroughly mixed with the casein before the addition of the lime. Copper salt may be placed in solution and conveniently stirred into the moistened casein immediately before the lime is added or after all the other ingredients have been combined. If the copper solution is added at the end of the mixing period, pour it into the glue in a thin stream and stir the mixture vigorously. Continue stirring until any lumps, which may have formed by the coagulation of the glue and the copper solution, are broken up and until a smooth violet-colored glue is obtained.

Glue prepared by this formula has proved to be exceptionally strong and durable, even under wet or damp conditions.

Formula No. 2

The mixing is the same as for above formula except for the omission of the copper chloride. The glue made by this formula has a medium consistency, excellent working properties, a good working life, and makes joints of high strength, but it falls somewhat short of the previous formula in water-resisting properties, especially when the lower amounts of lime are used.

Casein	100 oz.
Water	200 oz.
Sodium Hydroxide (Caustic Soda)	10 oz.
Water	50 oz.

Bring the casein and water together according to the directions for mixing glue prepared by previous formula. Dissolve the caustic soda in water in a separate container, and while the mixing paddle is revolving sprinkle the caustic soda solution into the damp casein. Stir slowly until a thin, smooth glue has been obtained. The consistency of the finished product may be altered by adding more casein if it is too thin, or by adding water if it is too thick. Silicate of soda is sometimes added to thicken or to reduce the cost of the glue per unit of volume.

This glue has exceptional strength when dry, but when exposed to moisture it weakens as rapidly as animal or vegetable glue.

Cold Glue (Casein)

Formula No. 1

a. Casein, Dry	70 g.
Trisodium Phosphate	10 g.
Lime Hydrate	20 g.
Sodium Fluoride	3 g.
b. Water	200 g.
Pine Oil	2 g.

a is soaked with *b*.

No. 2

a. Casein	60 g.
Lime, Hydrated	15 g.
Trisodium Phosphate	4 g.

Sodium Fluoride	4 g.
Nut Meal	17 g.
b. Water	200 g.

Stir *a* with *b*; paste ready after 20 minutes.

No. 3

Casein	20–30 g.
Caustic Soda (36° Bé.)	0.2–0.6 g. or 0.7–2 g.
Water	79.8–68 cc.

No. 4

Casein	20–30 g.
Soda Ash	2– 4.5 g.
Water	78–65.5 cc.

No. 5

Casein	20–30 g.
Borax	2– 5 g.
Water	78–65 cc.

No. 6

Casein	20–30 g.
Ammonia (sp. gr. 0.910)	10–24 cc.
Water	70–46 cc.

No. 7

Casein	12 g.	Knead
Borax	1.5 g.	
Ammonia (0.91)	1.5 g.	
Water	85 g.	

No. 8

Casein	20 g.	soak	Knead
Water	60 g.		
Disodium Hydrogen Phosphate	3 g.	dissolve	
Water	20 g.		
Caustic Soda (10%)	6 g.		

Mix all in warm water-bath.

No. 9

Casein	20 g.	Warm for ½–1 hour
Water	80 g.	
Borax	1 g.	
Ammonia (0.91)	2 g.	
Caustic Soda (36° Bé.)	2 g.	

Cool, at 50–60° C., add:

Waterglass (30° Bé.)	8 g.
Alcohol, Denatured	2 g.

Impregnation Glue

Casein	15–20 g.
Ammonia (sp. g. 0.910)	8–16 cc.
Water	77–64 cc.

"Pastel" Glue

Casein	25 g.
Ammonia (0.910)	20 cc.
Water	50 cc.
Glue Jelly	5 g.

Modern Casein Adhesive Powders

For use stir with *140 times* the amount of water (cold). After ½ to ¾ hour, a homogeneous, viscous solution is gotten ready for use.

Formula No. 1

Lactic Acid-Casein	70 g.
Marble-Lime Hydrate	13 g.
Trisodium Phosphate	5 g.
Sodium Fluoride	4 g.
Sodium Sulphate, Pure, Anhydrous	6 g.
Naphtha, Refined	2 g.

No. 2

Lactic Acid-Casein	60 g.
Slaked Lime	20 g.
Trisodium Phosphate	10 g.
Aniline	8 g.
Mineral Oil	2 g.

No. 3

Lactic Acid-Casein	50 g.
Slaked Lime	16 g.
Trisodium Phosphate	8 g.
Sodium Sulphite	8 g.
Sodium-Waterglass, Dry	6 g.
Copper Chloride	2 g.
Hardwood-Meal	10 g.
Mineral Oil	1½ g.

Air-plane Propeller Glue

1. Black Blood Albumen	1 g.	Mix at 15° C., stop mixing for two hours
Water	6 g.	
Add:		
Slaked Lime	0.06 g.	Mix until thick
Water	1 g.	

Mordant for Handles of Kitchen-Knives

a. Potassium Bichromate	15 g.
Water	1000 cc.
b. Ammonia (25%)	150–200 g.

Dissolve the chromate *a*, and add *b*.

Treat wood with solution, dry, rub over with a hard brush (horse-hair), optionally a thin polish.

Wood Veneer Adhesive
U. S. Patent 1,964,960

Casein	1 oz.
Ammonium Sulphocyanate	2 oz.
Paraformaldehyde	.02–0.4 oz.

Water sufficient to make fluid.

This will remain fluid for several hours at ordinary temperature. Coagulates on heating to give strong bond.

Cement for Filling Cracks in Wood

Consists of a mixture of 150 parts linseed oil, 30 parts varnish, 40 parts wax, 30 parts gypsum, 750 parts pigment.

(*Note:* Generally, wax is an objectionable constituent, from the standpoints of lessening adherence within the crevices and lack of cohesion of finishing coatings applied over such filled areas. Preferable material would be the present well-known plastic wood and wood doughs which are pyroxylin-base products utilizing wood flour. Representative composition (U. S. Patent 1,838,618) is Celluloid Scrap 19 lbs., Ester Gum 8 lbs., Castor Oil 3 lbs., Methyl Acetone 44 lbs., Wood Flour 26 lbs.; and if pigmentation may be desired, as follows—Celluloid 10, Ester 7, Castor 4, Acetone 15, Benzol 15, Alcohol 5, Wood Flour 24, China Clay 20.

Cheaper materials more popular with painters and decorators are the Water Putties in dry powder form; they are used for filling cracks and holes in wood trim, also for filling the spaces between flooring in both old and new floors. When thoroughly dry the applied putty has no tendency to shrink or crack. One product on the market for years is composed of 10 parts Quartz Silica, 2 parts Plaster of Paris, 1½ parts Dextrin. Pulverized Gum Arabic could be substituted for the dextrine and effect greater hardness; and addition of about one-half part of wood flour or fine sawdust would enhance the toughness of the putty. For using, only enough water is mixed with the putty powder to the consistency of regular commercial putty).

Wood Veneer Glue

Blood Albumen	40 g.
Casein	12 g.
Slaked Lime	6 g.
Sodium Fluosilicate	2 g.
Wood Meal	40 g.

Apply the adhesive by putting it on both sides of the middle piece of wood. If the adhesive is just too viscous, homogenize the adhesive layer. The wood pieces are put together, then pass through drying chambers at 90–95° C., under a pressure of 12–18 kg. per cc. until the albumen is coagulated.

Sealing Preparation for Wine-Barrels

Vaseline (40–42° C.) or so-called "*Traction-Paraffine*" (42–44° C.)	98–98.5 g.
Tallow, Hard Fat or Palm Oil	2– 1.5 g.

Impregnating "Green" Wood
Austrian Patent 142,431

Cover with the following paste and allow to remain until dry.

Sodium Fluoride	80 lb.
Sodium Dinitrophenolate	15 lb.
Kieselguhr	5 lb.

Water sufficient to make paste.

Gum Arabic Glue

Gum Arabic	15–20 g.
Lime Water, Saturated	10–20 cc.
Glycerin	1– 3 g.
Water	74–27 cc.

Mucilage

Gum Arabic, Amber Sorts	100 lb.
Water	150 lb.

Heat and stir until dissolved.

Strain and add

Oil of Cloves	5 oz.
Oil of Wintergreen	5 oz.
Salicylic Acid	5 oz.

Photo-Paste

Gum Arabic	30 g.
Saturated Lime Water	15 cc.
2% Tragacanth Solution	10 cc.
Water	45 cc.

Cold Water Paste
Australian Patent 8259

Wheat Flour	8 oz.
Alum	1 oz.
Water	8 oz.

Mix till smooth; evaporate till dry; powder.

Pasting Paper on Metal Surface

1. Clean off grease with hot soda solution.
2. Roughen with emery paper.
3. Prepare glue:

a. Water	4 kg.
Calcium Chloride	1 kg.
b. Bone Glue	1–2 kg.

Dissolve *a,* then swell *b* in the solution for 24–30 hours; heat on water bath to obtain solution.

Moldex or other preservative 0.1–0.2%.

Vegetable Mucilage

a. Water (Above 16° C.)	200 l.
Potato-Starch	100 kg.
b. Caustic Soda (35° Bé.)	28 kg.

Stir *a* to dispersion, sift, add slowly *b* under stirring, until glassy. Keep temperature low if *thick* mucilage is wished.

Higher temperature yields more fluid glues.

Library Adhesive Paste

a.	Capillary Syrup (42–44° Bé.)	70 kg.
b.	Water, Boiling	20 l.
	Borax	8 kg.
c.	Caustic Soda (40° Bé.)	2–3 kg.
d.	Sulphurous Acid (5° Bé.)	0.5 kg.
e.	Formalin	0.5 kg.

Add *b, c, d, e,* in the given order separately to *a,* stirring strongly. When ready, dye with a little burnt sugar color.

Carton Glue

Dextrin, Light	100 g.	dissolve hot
Borax Solution (10%)	70 g.	
Caustic Soda (40° Bé.)	5 g.	add when cool

Let stand several days.

Cardboard Glues

1.	Casein	13 g.
	Trisodium Phosphate	1 g.
	Ammonia (0.91)	2 g.
	Water	85 g.
2.	Casein	10 g.
	Borax	2 g.
	Glucose	2 g.
	Waterglass (30° Bé.)	15 g.
	Water	71 g.

Padding Glue

1.	Glue (Nat. Assoc. 8–10 Grade)	10 lb.
2.	Glycerin	10 lb.
3.	Water	12 lb. 2 oz.
4.	Zinc Oxide	1 lb. 3 oz.
5.	Beta Naphthol	¼ oz.
6.	Methyl Salicylate	1 oz.

Mix 2 and 4, then add 5 and 3, and then 1. Let stand over night, warm and stir until uniform; add 6 and pack.

In hot humid weather this glue may set too slowly. This may be corrected by

a. Using a higher grade of glue, or
b. Using less glycerin (which will, of course, reduce flexibility), or
c. Dusting surface after partial drying with talc or precipitated chalk.

Tabbing Compound
U. S. Patent 1,966,389

775 parts of uncoagulated vulcanized latex, containing 40 to 42% by weight of total solids constitutes the first ingredient.

The second ingredient is prepared by dissolving 50 parts of casein in about 150 parts of distilled water (preferably with the addition of an alkali which may be caustic soda, alkaline sodium salts or ammonia).

Third, 50 parts of egg albumen are dissolved in about 200 parts of water to produce a highly viscous solution.

A fourth component is made by adding 125 parts of a 2% ammonia solution, to 5 parts of dried wood fibre and 5 parts of cellulose flocks (or other fibrous material) and the mixture is stirred until a substantially uniform suspension is produced. A small amount of a deodorant composition such as oil of wintergreen can also be added at this point if desired.

The casein solution and the egg albumen solution are then added slowly with constant stirring to the vulcanized uncoagulated latex, and the stirring is continued until a uniform or homogeneous mass is produced. If desired, suitable coloring materials can be added at this stage and can be thoroughly stirred in.

The ammoniacal liquor containing the fibrous material "fourth component" is then added and the entire mixture thoroughly stirred or churned in order to produce a uniform mixture. This mixture is then ready to be used for tabbing, or it can be simply canned and used at any subsequent time.

For tabbing, the paper is jogged if desired to give a substantially smooth surface of edges, to which one coat of the material is brushed on rapidly. Then after five or ten minutes a second coat is preferably applied. This second coat can be daubed on heavily, and quickly brushed down to a smooth coating. The composition will dry firm and the exposed surface will be substantially free from tackiness in about half an hour or sometimes twenty or twenty-five minutes, depending upon atmospheric conditions. The complete strength of the composition is however not developed for several hours after application. If desired, the tablets can be allowed to stand quiet for several hours, until substantially the maximum strength has developed. The surface can be finally dusted over with a suitable pulverulent material, such as talc powder if desired, although ordinarily this will not be found necessary, since the composition after drying does not stick to other surfaces with which it comes into contact, at least to an objectionable degree.

The brushes or the like used in applying the composition can be readily cleaned by being washed in water, and any of the material which gets onto the hands of the user can be readily washed off with water.

In case the solution becomes too thick, it can be diluted with soft water (preferably rain water or distilled water). Hard water would be injurious to the compound.

Label Gum

Formula No. 1—Fluid

Gum Arabic	30 g.
Saturated Lime Water	15 cc.
Glycerin	1 g.
Water	54 cc.

No. 2—Less Fluid

Gum Arabic	35 g.
Aluminum Sulphate Crystals	2 g.
Glycerin	2 g.
Water	61 cc.

No. 3—Viscous

Gum Arabic	30 g.
Aluminum Sulphate Crystals	2 g.
2% Tragacanth Solution	20 cc.
Water	48 cc.

Label Glue

Formula No. 1

Casein	20 g.
Ammonia (sp. g. 0.910)	16 cc.
30% Rosin Soap	5 g.
Water	59 cc.

No. 2

Water-Resistant

Casein	20 oz.
Ammonia (0.910)	5 oz.
Waterglass (30° Bé.)	6 oz.
Water	70 oz.

Library Mucilage

Formula No. 1—Fluid

Gum Arabic	25 g.
Saturated Lime Water	15 cc.
Glycerin	1 g.
Water	59 cc.

No. 2—Less Fluid

Gum Arabic	40 g.
Lime Water, Saturated	20 cc.
Glycerin	2 g.
Water	38 cc.

No. 3—Viscous

Gum Arabic	20 g.
Aluminum Sulphate Crystals	2 g.
2% Tragacanth Solution	15 cc.
Water	63 cc.

Paper Mucilage

a.	Dextrin, Middle Pale	50 oz.
	Water	50 oz.
b.	Sodium Bisulphite	0.5 oz.
	Borax	1.0 oz.
	Camphor	a grain

Stir cold until lump-free, warm until the mucilage is formed. Add *b* for deodorizing and preservation.

Adhesive for "Gumming" Papers

Gum Arabic	30 g.
Saturated Lime Water	15 cc.
Glycerin	2 g.
2% Tragacanth Solution	5 cc.
Water	48 cc.

Paper Bag Glue

Casein	22 g.
Borax	3 g.
Venice Turpentine	3 g.
Water	72 cc.

The casein has to be treated (swelled) at 50–70° C. When treating with ammonia, heat up higher at the end to evaporate the excess. Moldex or other good preservative is to be added after the alkaline treatment in proportions of about 18–25 ounces per 100 gallons. If too viscous or too thin, add or evaporate water.

Let stand to clear up.

Carton Glue

Casein	25	g.
Caustic Soda (36° Bé.)	0.5 or 1.7	g.
30% Rosin Soap	10	g.
Water	64.5–63.3	cc.

Waterproof Adhesive
U. S. Patent 1,965,778

Formula No. 1

Casein	100 lb.
Water	225 lb.
*Wax Solution	3 lb.

No. 2

Vegetable Protein Glue	100 lb.
Water	325 lb.
*Wax Solution	3 lb.

* Consists of:

Carbon Bisulphide	8 lb.
Carbon Tetrachloride	8 lb.
Paraffin Wax	1 lb.

Non-Caking Dextrin Adhesive
French Patent 783,963

Dry adhesives having a basis of dextrin which dissolve in cold water without caking are made by heating dextrin to

about 80° C. for ½ hour with about 1% of a polyhydric alcohol, e.g., glycol.

Mucilage for Paper, Photos, Printed Matter

a. Soft Water	35 g.
Sugar	1 g.
Wheat Starch	3 g.

Warm and stir until glassy.

b. 19 parts of a 20–25% gum arabic solution.

Solution *b* is added to *a* when the starch has become "*glassy.*" Preserve with phenol or oil of cloves.

Gummed Labels for Brass, Tin

Moisten with:

Acetic Acid	8 fl. oz.
Glycerin	2 fl. oz.
Water	6 fl. oz.

U. S. Postage Stamp Glue

Gum Arabic	1 lb.
Starch	1 lb.
Sugar	4 lb.

Distilled Water sufficient to give desired consistency.

Adhesive for Waxed Papers

Formula No. 1

Thickened Spirit-Lacquer
or
Acetyl Cellulose-Solution

No. 2

Rosin	60 g.
Mastic	10 g.
Sandarac	20 g.
Ether	5 g.
Alcohol	75–100 g.

No. 3

Chromium Gelatin
or
Canada Balsam

No. 4

a. Cologne Glue (or Gelatin)	100 g.
b. Acetic Acid, Dilute	200 g.
c. Potassium Bichromate	5 g.

Soak *a* in *b*, then dissolve on steam bath, add *c*.

No. 5

Alcohol	100 g.
Ether	5 g.
Rosin	60–70 g.
Sandarac	20 g.
Mastic	10 g.

Celluloid Cements

Formula No. 1

Pyroxylin	200 g.
Camphor	40 g.
Gum Elemi	8 g.
Amyl Acetate	2600 cc.
Acetone	500 cc.
Methanol	400 cc.

No. 2

Celluloid Shavings	240 g.
Gum Elemi	8 g.
Acetone	500 cc.
Methanol	1500 cc.
Amyl Acetate	1500 cc.

No. 3

Pyroxylin	160 g.
Camphor	40 g.
Methanol	2100 cc.
Fusel Oil	1400 cc.
Castor Oil	280 cc.

No. 4

Celluloid Shavings	40 g.
Gum Elemi	8 g.
Benzol	1000 cc.
Amyl Acetate	1000 cc.
Methanol	800 cc.
Acetone	600 cc.

No. 5

Pyroxylin	150 g.
Camphor	40 g.
Methanol	2525 cc.
Amyl Acetate	1260 cc.

Cement for Safety "Movie" Films

The formula below was developed especially for safety films and acetate type of transparent sheeting.

Cellulose Acetate	4 oz.
Tri-Phenyl Phosphate	2 oz.
Acetone	60 oz.
Di-Acetone Alcohol	9 oz.
Benzol	15 oz.
Methanol	10 oz.

The cellulose acetate of high viscosity film quality is preferred. However, washed safety movie film free from the gelatin coating, or other source of reclaimed cellulose acetate may be used. Instead of tri-phenyl phosphate plasticizers of the toluene sulphonamid type such as the Santicizers may be used.

Movie Film Cement

This composition is effective on either the inflammable or safety type films. In using this cement it is preferable to scrape off the gelatin coating with a knife or steel wool.

Cellulose Nitrate	4 oz.
Tri-Cresyl Phosphate	2 oz.
Ethyl Acetate	55 oz.

Butyl Acetate	14	oz.
Benzol	15	oz.
Methanol	10	oz.

The cellulose nitrate may consist of a good grade of high viscosity nitro-cotton or clean new celluloid scrap or nitrate movie film with the gelatin coatings removed. If new cellulose nitrate is not used, the tri-cresyl phosphate can be reduced about one-half. The solvents are mixed together in the above proportions by weight and the cellulose nitrate added.

Pyroxylin Cement

Celluloid Scrap	40	g.
Amyl Acetate	350	cc.
Wood Alcohol	100	cc.
Ethyl Alcohol, Denatured	50	cc.
Gum Elemi	15	g.

Methyl Cellulose Adhesive

Methyl Cellulose	1	lb.
Water	40–60	lb.

Warm together and stir until uniform.

"Cellophane" Adhesive
U. S. Patent 1,972,448

Chlorinated Polyphenyl Resin (125° C. softening point)	62.5	lb.
Dibutyl Phthalate	5.4	lb.
Silica, Finely Ground	32.1	lb.

Cigarette Paper Adhesive
Formula No. 1

Pectin	54	oz.
Bone Glue, Liquid	13.5	oz.
Bone Glue, Solid	13.5	oz.
Dextrin	19	oz.

No. 2

Pectin	60.5	oz.
Bone Glue, Fluid	16.5	oz.
Bone Glue, Solid	6.6	oz.
Dextrin	12.5	oz.
Rye Flour	4.0	oz.

No. 3

Pectin	50	oz.
Bone Glue, Solid	10	oz.
Dextrin	10	oz.
Rye Flour	5	oz.

In the above formulae add sufficient water to make a mucilage of desired consistency.

Primer for Wall Paper Paste
U. S. Patent 2,005,900

Sodium Silicate	50	oz.
Water	44	oz.
Copper Sulphate (12½% Solution)	6	oz.

Mailing Tube Adhesive

Glue, Ground Animal	40	oz.
Water	54.7	oz.
Nitric Acid	5.0	oz.
Phenol	0.3	oz.

Sealing of "Transparit," "Helioglas," or "Cellophane" Packages

a. Methyl Acetate 80 cc.
Ethyl Lactate 20 cc.

b. Collodion-Wool or washed film-scrap, as much as necessary to give a viscous solution (like 30–31° glycerin)

"Cellophane Adhesive"

Arabic, Gum	16.5	oz.
Glycerin	20.5	oz.
Glyceryl Bori-borate	9.0	oz.
Formaldehyde	4.5	oz.

Cardboard and Nitrocellulose Sheet Cement
U. S. Patent 1,969,477

Nitrocellulose	4.5	oz.
Camphor	1.0	oz.
Acetone	30.0	oz.
Ethyl Lactate	10.0	oz.
Xylol	55.0	oz.
Water	5.0	oz.

Liquid Sealing Wax
French Patent 751,683

Turpentine	100	cc.
Shellac	150	g.
Zinc Oxide	30	g.
Methanol	25	cc.

Mix until free from lumps. This dries in air after applying.

Elastic Sealing Wax

Rubber Latex (60%)	165	oz.
Shellac	12	oz.

Warm together with stirring until all moisture is driven off.

De Khotinsky Type Laboratory Cement
Improved Type

Shellac, Flake	100	g.
*Plasticizing Solvent	15 to 30	g.

Heat the solvent to 120° C., and slowly stir in the shellac flakes. When the shellac is thoroughly dissolved and the mixture homogeneous, cool slightly until the mixture pours with difficulty. Immediately pour into long tin molds of about one-half inch square cross section which have previously been treated lightly with petrolatum.

* As a "plasticizing solvent" pine tar has been widely recommended, but is inferior,

since the excessive amount of 60 to 100 grams is required. The oil distilled from white-pine tar over the range of 200° to 325° C. is much better, yielding a tougher cement. Wood creosote or similar mixtures of substances like guaiacol, cresol and other low-melting, high-boiling phenols may be used; also trimethylene glycol or other slightly oxygenated organic solvents of high boiling point. The range of 15 to 30 grams approximately covers the variations of hardness commonly desired.

"Boltwood Wax"
(For cementing physical instruments)

Shellac	40 g.
Rosin	72 g.
Venice Turpentine	8 g.
Beeswax	60 g.
Talc, Dry	16 g.
Tin Oxide, Dry	16 g.

Melt the rosin, add the shellac. Heat to 200° C., add the Venice turpentine and beeswax. Heat the mixture strongly with stirring until it ignites spontaneously. Let it burn until the total mass has shrunk to about 40% of its original weight, then add the talc and tin oxide. This gives a tough, smooth, waxy cement more easily handled on certain delicate instruments than the de Khotinsky type cement.

Leather Sole Cement

Nitrocellulose	22.5 g.
Alcohol	22.5 g.
Benzol	31.1 g.
Ethyl Acetate	9.5 g.
Camphor	1.1 g.
Acetone Oil	0.09 g.
Castor Oil	0.09 g.

Cement for Leather or Leather on Rubber

Gutta-Percha	21.6 oz.
Carbon Bisulphide	17.7 oz.
Benzene	2.9 oz.
Turpentine Oil	23.5 oz.
Asphalt	34.3 oz.

Leather Cement

Celluloid	11.9 oz.
Naphthalene	1.2 oz.
Acetone	67.1 oz.

Cement for Stone and Leather, Porcelain and Leather, Glass and Leather

Crude Rubber	9.1 oz.
Heavy Benzine	45.5 oz.
Japan Wax	13.6 oz.
Colophony	31.8 oz.

Concentrated Rubber Cement
German Patent 599,405

a. Caoutchouc	10 g.
Benzol	90 g.
b. Nitric Acid (52.77%)	1 g.

a gives after 24 hours stirring a homogeneous paste, which is depolymerized by adding *b*. When paste is dissolved, stop reaction by adding barium carbonate. Treat then with antimony trichloride or phthalic acid.

Rubber Cement
(Will firmly fasten rubber to almost any substance)

India Rubber (finely chopped)	100 oz.
Rosin	15 oz.
Shellac	10 oz.
Carbon Disulphide, sufficient to dissolve	

Softening Hardened Shoe Adhesive
German Patent 605,725

Cellulose nitrate adhesives used in shoe cements are softened by the following:

Pyroxylin (1100 second)	62 oz.
Alcohol	26 oz.
Acetone	450 oz.
α-Propylene Oxide	225 oz.

Shoe Repair Cement
U. S. Patent 2,004,059

Crepe Rubber	6 lb.
Rosin	2½ lb.
Accelerator	1½ lb.
Benzene	15 gal.

Porous Leather Sealer

Shellac	14 lb.
Rosin	1 lb.
Alcohol	5 gal.
Butyl Alcohol	¼ gal.
Castor Oil	4 oz.

Leather Belt Cement

a. Glue, Hide	50 g.
b. Water	200 g.

Soak *a* in *b*, pour excess water off, and melt the soaked *a* with:

c. Glycerin	2%
Potassium Bichromate	2%

When cooled, pour into oiled metallic forms; pack the gelatinous product at once into grease-proof paper.

Apply on roughed surface, while the sharpened ends are pressed together for 6 to 10 hours.

Belting Cement

Hide Glue	2¼ lb.
Water	2¼ lb.
Glycerin	9 oz.
Carbolic Acid	3/16 oz.

To use, melt and apply hot to the leather belt and place the joint under pressure until the glue is thoroughly set.

Canvas Awning Cement
U. S. Patent 2,011,218

Rubber Latex	10 oz.
Varnish	1 oz.
Citronella Oil	1/100 oz.
Nigrosine B Solution	1/100 oz.

Textile Glue
(for Doubling of Cloth, Shirting, Drill)

Casein	15 oz.
Soft Soap, Pure	5–10 oz.
Borax	2 oz.
Water	75 oz.

Warm and stir together.

Jute or Burlap Sheet Binder
British Patent 412,498

Gilsonite	11 lb.
Asphalt, Petroleum	23 lb.
Naphtha, Petroleum	35 lb.
Mineral Silicate Filler	15 lb.
Asbestos, Fibrous	15 lb.
Linseed Oil	2 lb.

Upholsterer's Paste

Prepare *a*

a. Calcium Chloride Solution (25° Bé.)

cleared by pouring off solution from settled dirt, and add 160 kg. to

b. Potato-Starch	100 kg.
Water	100 l.
(Heated to 60–65° C.)	

This glue has a good binding power, but dries very slowly and is hygroscopic.

Fine Bookbinder's Paste

Dissolve in

Water, Boiling	100 l.
Trisodium Phosphate	15 kg.
Borax	2.5 kg.
or Alum	10 kg.

and add with stirring, a solution of:

Water, Cold	120 l.
Starch	50 kg.

Warm until fluid.

Upholsterer's and Bookbinder's Paste

a. Potato-Starch	50 kg.
Water, Cold	140 l.
b. Caustic Potash (50° Bé.)	6 kg.
Sodium Silicate	15 kg.
Water, Cold	50 l.
c. Acid to neutralize to weak alkalinity	
d. Rosin Soap, Warm Fluid	5 kg.

Stir *a* till smooth, warm and stir with *b* to form a mucilage. Stir ¾ to 1 hour more, add *c*, then *d*, and stir slowly.

Bookbinder's Paste

a. Rye or Wheat Flour	100 kg.
Water, 25° C.	200 l.
b. Caustic Soda (35° Bé.)	24 kg.
c. Nitric Acid	until neutral
d. Alum, Cold Saturated Solution	20 kg.

Stir *a* to dispersion, treat mildly with *b*, neutralize with *c*, and add *d*.

Adhesive Paste for Rubber-Cloth on Cardboard

a. Gutta Percha, Finely Cut	18 g.
Carbon Disulphide	20 g.
Benzene	10 g.
Turpentine Oil	10 g.
b. Colophony	42 g.

a is mixed and soaked several days, then add *b* with gentle warming.

Mending China, Pottery and Casts

Save all the pieces of the broken article and store where the edges will keep clean until the repair is made. If the edges become soiled they should be washed clean and allowed to dry. The edges may be sanded lightly if necessary to remove the soil. The worker should know where each piece belongs before the work is begun. Small pieces should be cemented together previous to the main repair. A sand box is convenient to hold pieces upright while making the repair leaving both hands free for the work. It is made by putting 8 inches of clean sand in a convenient sized box.

Have at hand the cement, rubber bands, a bowl of warm water, tissue and soft rags. One rag should be reserved for wiping the fingers. Do not work with sticky fingers. Be accurate. If some part is not true after having been put together, soak until the cement is dissolved, wash the edges and begin over. Warm water will dissolve plaster or whiting cement and turpentine or alcohol will dissolve others.

The most durable cement is pure white lead ground in linseed oil, so thick that it will barely spread smooth with a knife. After drying thoroughly (about three months) it makes a seam which is practically indestructible but the mend is very conspicuous.

A less conspicuous cement is made of beaten egg white and sifted whiting or plaster of Paris. A small amount should be mixed at a time as it hardens quickly. In some cases it is just as satisfactory to brush the edges with beaten egg white and dust well with sifted plaster tied loosely in double mosquito netting. The pieces should be fitted together at once and held in place by rubber bands (placed lengthwise, crosswise and diagonally) wrapped loosely in tissue paper and buried in a sand box. Care should be taken that the break lies so that the weight of the sand will hold it together. Leave it in the box at least 24 hours. After a week the superfluous plaster may be scraped away.

Sometimes the rubber bands will not hold the pieces true on a stemmed article, a vase or a jug. In this case string six bands of the same size and strength upon a piece of tape. Tie the tape around the neck or base of the article before beginning the gluing. After the parts are joined slip another tape through the bands and tie above the fracture. The bands pulling in unison will hold the break together. The pressure on all mended fractures should be great enough to force out the tiny air bubbles which otherwise reflect light making the seam conspicuous.

Universal Putty for Wood, Stone, Glass, Porcelain

(Dries after 24–30 hours)

a.	Alabaster Gypsum	4 oz.
	Gum Arabic	1 oz.
b.	Cold Borax Solution, Saturated.	

Stir until pasty.

Preserve Jar Sealing Wax

Washes off easily with hot water.

Paraffin Wax	35 g.
Trihydroxyethylamine Stearate	3 g.

Paraffin Bottle Cap Adhesive
U. S. Patent 1,964,380

Chicle	1 oz.
Dammar	1 oz.
Petrolatum, Liquid	½ oz.

Warm and stir until homogeneous.

Bottle-Cap Varnish

Dissolve 2 oz. of red Sealing-wax in 5 oz. of denatured alcohol.

Seal for Bottles

Beeswax	5 g.
Carnauba Wax	1 g.
Paraffin	1 g.
Minium	5 g.
Whiting	2 g.

To Seal Glass Tubing to Iron Tubing

Grind the ends you wish to join to a tapered fit and then seal by fusing with silver chloride.

Cement for Vacuum Tubes

Marble Flour	85 oz.
Shellac	10 oz.
Rosin	5 oz.
Phenol Formaldehyde Resin	25 oz.

Glass to Metal Seals

Formula No. 1

Iron	37 oz.
Nickel	30 oz.
Cobalt	25 oz.
Chromium	8 oz.

The above is suitable for use with lead-glass.

No. 2

Iron	54 lb.
Nickel	28 lb.
Cobalt	18 lb.

Suitable for use with Corning glasses.

Safety Glass Adhesive
U. S. Patent 2,009,029

Formula No. 1

A small portion of casein is heated in an open vessel with twice its weight of glycerol and 1.0% by weight sodium hydroxide (based on the casein). The temperature is brought gradually to 150–165° C. over a period of 15 minutes with continual stirring, and then held at this point for an additional 30 minutes. This product is a clear liquid at 100° but rubbery and very slightly opaque on cooling to room temperature. This material while hot may be pressed between two hot pieces of glass until air bubbles disappear. On cooling a piece of sandwich

glass is obtained in which the glass plates are firmly held together.

No. 2

Fourteen and nine-tenths (14.9) parts glycerol, 35.1 parts phthalic anhydride and 10.0 grams sheet gelatin (broken into small pieces) are heated with stirring in an open aluminum vessel, one hour up to 200° C. and 4 hours at 200° C., or to an acid number of 65–70. Some difficulty may be experienced in the early stages in making the bulky masses of gelatin mix with the other materials. This resin may be used as the sandwiching material for glass, or dissolved in a solvent such as acetone and used as an adhesive or impregnating agent.

Mastic Seal for Oil Drums
German Patent 613,748

Aluminum Powder	30 kg.
Nitrocellulose	14 kg.
Butyl Acetate	21 kg.
Ether	35 kg

Glass Electrical Cements

To offset the greater thermal coefficient of expansion of ordinary cement (11.5×10^{-6}) against that of porcelain (4.5×10^{-6}) a mixture of cement and powdered quartz or cement and crushed porcelain may be used. The thermal coefficient of expansion has approximately the following values:

Percent Quartz	0	20	40	70	80
Coefficient of Expansion	11.5	10	8.5	5.5	4×10^{-6}
Percent Porcelain	0	20	40	60	80
Coefficient of Expansion	11.5	10.5	9	7.5	6×10^{-6}

The quartz cement mixtures for values of quartz between 40% to 70% usually shows the same coefficient of expansion as pure cement. The modulus of elasticity of the quartz cement mixture increases with increasing quartz content. The bending strength, however, decreases almost in proportion to the percent quartz. The impact or shock bending strength, however, is practically unaffected up to 50% quartz content.

Porcelain and metal surfaces should be given a coating of a good elastic varnish before cementing. The cement should be allowed to harden in a steam chamber or, at least, be kept thoroughly wet for the first forty-eight hours.

Another good porcelain cement is the usual litharge glycerin cement. This should be made in a ratio of three parts litharge and 1 part glycerin by weight. The glycerin used should contain less than 15% water and the litharge must, as far as possible, be free of lead carbonates as they produce a porous, weak cement.

A filler of up to 40% crushed or powdered porcelain may alse be used advantageously with the litharge. All exposed surfaces of cement should be given a thoroughly protecting coating of a good grade of Glyptal or Bakelite varnish.

1.

Litharge and glycerin ratio about 75/25 sample poured in a 25 mm. diameter glass tube hardens to a solid mass in less than 24 hours, but on further drying gives off additional moisture thereby slightly decreasing its dimensions so that it can be pushed out of tube. Swells on moist days sufficiently to firmly hold sample in glass tube. It is now adhering to glass. Under the microscope it shows a fairly dense even mass with numerous minute air-bubbles which appear to be coated with a shiny scale. Cracks when heat is locally applied and apparent traces of glycerin start to burn with a slow glowing, causing bubbles to be formed. Mechanically very rigid and strong, water absorption in 14 hours—1.6% by weight.

2.

Equal parts litharge and crushed porcelain plus glycerin to make a good flowing cement. Hardens in less than 24 hours, forms a hard solid body which cannot be moved in glass tube but under the microscope shows somewhat more porous than No. 1, especially around the coarser grains of crushed porcelain. Mechanically rigid and strong.

3.

Glens Falls Cement Company iron clad portland cement and water. Cement poured in 25 mm. diameter glass tubes, hardens in less than 24 hours but 7 days is recommended by the manufacturer to give it full strength. One test tube was kept under water for the first 48 hours according to the recommendation of the manufacturer and one tube air dried only. The air dried cement could be hammered out of glass tube and under the microscope showed minute air bubbles imbedded in the solid material. The sample set under water showed a very dense homogeneous body composed of minute bright crystals imbedded in a

mass of various dull colored material. The sample set under water showed considerable more strength and toughness than the air dried absorption in 14 hours —8.8% by weight.

4.

50% "iron clad" portland cement, 50% crushed porcelain. Sufficient water to readily pour sample set under water for the first 48 hours and allowed 6 days for air hardening. This sample gave a hard tough body of high mechanical strength. Under the microscope it showed the porcelain particles very densely imbedded in the material and traces of air bubbles could only be found around the larger porcelain grains. It appears to be a very promising cement for porcelain cementing. Number 4 very closely resembles the so-called "Teleo" Cement patented by the porcelain factory Treiberg in Thyringen, Germany, and consisting of portland cement and crushed quartz glass. This cement was developed with a view of obtaining a cement of approximately the same temperature expansion as that of porcelain. This is obtained by mixing a sufficient quantity of crushed quartz glass with an expansion coefficient of 0.5×10^{-6} with the portland cement having an expansion of 11.5×10^{-6} to give an expansion coefficient of approximately equal to that of porcelain of 4.5×15^{-6}. Further tests on the various cements are necessary in order to fully determine the mechanical properties.

Summary

The indications from the above preliminary tests, therefore, are that litharge and glycerin in a ratio of about 80/20 by weight or a mixture of 7 parts Glens Falls iron clad cement and 3 parts powdered porcelain or perhaps still better powdered quartz and water is the most suitable cement to use for bushing work.

The metal and porcelain surfaces to be given one coat of clear "Valspar" varnish to take care of the variation in expansion and all free surfaces of the cement to be given two or three coats of varnish as a protection against moisture.

To Plug Holes in Metal

Mix powdered sulphur and powdered aluminum 1–1 and pour on the metal which should be hot and clean. Then heat to melt the sulphur.

Metal Glue (for Tins, Etc.)

Resin (Shellac, Sandarac)	50–100 g.
Manila-Kopal, Soft	50– 0 g.
Galipot or Turpentine, Thick	3 g.
Alcohol, Denatured	100–200 g.
Castor Oil	1 g.

Pipe Joint Lute
German Patent 597,044

Tallow	1 lb.
Mineral Oil	1 lb.

Melt together and mix with:

Ochre	1 lb.
Dry Clay or Sand	7 lb.

Premolded Expansion Joint

Chinawood Oil, Polymerized	5 lb.
Bitumen	85 lb.
Mineral Filler	10 lb.

Sulphur Thiokol Cements
Formula No. 1

Sulphur	58.8 lb.
Thiokol	1.2 lb.
Sand	40.0 lb.

No. 2

Sulphur	58.8 lb.
Thiokol	1.2 lb.
Sand	38.0 lb.
Carbon Black	2.0 lb.

Refractory Cement
U. S. Patent 1,952,119

Magnesium Oxide, Powdered	
(Deadburned)	50 lb.
(Fused)	15 lb.
Zircon Sand	
60-mesh	25 lb.
300-mesh	10 lb.

Sodium Silicate (d. 1.3) sufficient to make paste.

High Temperature Luting Compound

Alumina	50 lb.
Magnesia	25 lb.
Kaolin	25 lb.

Sodium Silicate sufficient to bring to a working consistency.

Nitric Acid Resistant Putty

White Asbestos Powder	20 parts
Blue Asbestos Fiber	10 parts
China Clay	10 parts
Linseed Oil	20 parts

A cement for nitric acid plants contains:

Blue Asbestos Powder, and
Sodium Silicate 1.5 Tw.

Asbestos Binder
U. S. Patent 2,010,224

Shellac	48 oz.
Dicyandiamide	2 oz.

Heat together and stir until uniform.

Acid-Proof Dental Cement

Make a concentrated solution of silicate of soda and form a paste with powdered glass. Invaluable where a luting is required to resist the action of acid fumes.

Dental Cement
British Patent 430,624

Lithium Phosphate	½ oz.
Phosphoric Acid	5 oz.
Zinc Phosphate	½ oz.
Aluminum Phosphate	⅓ oz.

The above is added to a ground porcelain of following composition:

Alumina	30–50 oz.
Feldspar	10–20 oz.
Sand	25–40 oz.
Zinc Oxide	1–10 oz.

Boiler Lagging

A splendid boiler lagging can be made by the following formula and applied direct to the boiler with a trowel, or molded into sections or blocks of suitable size and then dried and applied in the form of the usual sectional lagging:

1. 200 lb. spent Carbide Residue, drained to a soft putty consistency.
2. 100 lb. Asbestos Fiber or Asbestos Fiber and Magnesia. (Old lagging properly ground will be satisfactory.)
3. 50 lb. Fine Dry Pine Sawdust.

Mix 2 and 3, then add 1 and mix thoroughly. If too dry add a small quantity of water. If oak or wet sawdust is used, quantity should be increased in the same proportion as the difference in weight per cubic foot.

It has also been found that carbide residue mixed with equal parts of Fuller's Earth will produce a good heat insulator for small furnaces.

Silicate Cements

Composition	*Methods*	*Remarks*
Silicate of Soda	Apply to porous surface and wash with dilute sulphuric acid after setting	Acid-proofing of wood, unglazed tile, etc.
Silicate of Soda and Asbestos Fiber	Mix to paste and wash with dilute sulphuric acid to develop acid-resistance after setting	General acid-proof cement and lute; also used for setting acid-proof bricks, etc.
Silicate of Soda and Silica or Clay	Mix to paste and wash with dilute sulphuric acid to develop acid-resistance after setting	Acid-proof and refractory
Silicate of Soda and Whiting	Mix to paste and wash with dilute sulphuric acid to develop acid-resistance after setting	
Silicate of Soda and Diatomaceous Earth	Mix to paste and wash with dilute sulphuric acid to develop acid-resistance after setting	
Silicate of Soda and Portland Cement	Very quick setting; make only as needed	For setting acid-proof tiles; waterproof
Silicate of Soda and Zinc Oxide, with or without added Clay		Used as a binder in abrasive wheels; water-resistant
Silicate of Soda and Sawdust or Wood Flour	Portland cement may be added	Strong bond; water-resistant; also resistant to weak acid
Silicate of Soda and Copper Powder		For protecting spots during case hardening

Silicate Cements—*Continued*

Composition	*Methods*	*Remarks*
Silicate of Soda and Barytes Flour	Make to a stiff paste	Resists wet chlorine
Silicate of Soda and Duriron Dust	Make to a stiff paste	Used for temporary repairs of Duriron
Silicate of Soda and Silica Flour and Sodium Fluosilicate	Make to a stiff paste	Used for temporary repairs of Duriron
Silicate of Soda and 20 Manganese Dioxide; 20 Zinc Oxide; 10 Kieselguhr; 3 Graphite	Make to a stiff paste	Used for repair of metal parts; becomes highly acid resistant on setting.

Glycerol-Litharge Cements

Composition	*Methods*	*Remarks*
a. Glycerol and Litharge	Mix to a paste and apply promptly; varying the proportions, changes characteristics	Proportions vary; addition of water to glycerol hastens setting (2 water to 5 glycerol sets in 10 minutes)
b. (a) plus Whiting	Slower setting than straight cement	
c. (a) plus Silica	Slower setting than straight cement	
d. (a) plus Ferric Oxide	Slower setting than straight cement	
e. 1 part Litharge; 1 part Silica; 1 part Portland Cement, Glycerol and Silicate of Soda (diluted)	Addition of silicate controls setting time	Sulphite digester linings; dilute sulphuric acid
f. 1 part Litharge; 1.5 parts Silica; 1.5 parts Portland Cement; Glycerol and more Silicate	Mix to a putty consistency	For sulphur dioxide gas (wet); resists hot solutions
g. 5 parts Litharge; 3 parts Silica; 2 parts Quartz Flour; c.p. Glycerol	Mix to a putty consistency	For sulphur dioxide gas (wet); resists hot solutions
h. Glycerol and Litharge plus Graphite	Mix to a putty consistency	Used on pipe joints which can be taken apart easily
i. Glycerol and Red Lead	Mix to a putty consistency	Acid-resistant joints in iron; sets hard

Miscellaneous Cements

Composition	*Methods*	*Remarks*
Iron Filings (100); Ammonium Chloride (1); water	Mix to a thick paste	Used to repair cast iron, etc.; resistant to heat but not acids
Asbestos Wicking and Rubber Cement (rubber dissolved in benzene)	Soak wicking in cement and force into joint (not too strongly)	Used as caulking on fused silica and stoneware bell and spigot joints; proof against moisture and dilute acids; flexible

Miscellaneous Cements—*Continued*

Composition	*Methods*	*Remarks*
Lead Wool	Caulk into joints	Used in the same way as poured lead joints in bell and spigot pipe
Asbestos Wicking	Used as a caulking with or without asphalt or other cement to protect it	Resists common acids except hydrofluoric
White Lead and Varnish Putty	.25 to 1.5 gal. of hard drying varnish to 100 lb. paste white lead in linseed oil	For jointing marble, stone, glass, etc.; an adhesive, slow-hardening cement
White Lead Paste with Read Lead	Red lead added to give the heaviest workable paste	For threaded pipe joints; can be opened
Lead Filings	Lead is filed on to pipe threads moistened with lubricating oil	Makes tight threaded joints
Red Lead in 3 parts, raw Linseed and 1 part medium Lubricating Oil	Mix to stiff paste	Adheres tenaciously to metal; remains soft and elastic; fillers may be added
Cellulose Acetate solutions (with or without fillers)	Applied as a sealing compound	General service adhesive
Cellulose Nitrate solutions (with or without fillers)	Applied as a sealing compound	General service adhesive
Rubber, Linseed Oil, Asbestos Fiber	Rubber is dissolved in hot oil and asbestos added to make a thick putty	For joints in stoneware, etc.; forms an elastic mass
Sulphur in various mixtures	Sulphur is melted and mixed with clay, silica, etc., to form a putty	Applied hot as a grouting; resists acids and alkalis
Self-vulcanizing Rubber Cement	Painted or trowelled in place	Resists both corrosion and abrasion
Numerous resin base proprietaries		Resist dilute acids
Synthetic resin varnishes		Resist acids and weak alkalies
Soaps (particularly of heavy metals)	Made to a putty with linseed or other drying oil	Resists hydrocarbon solvents
3 lb. dry White Lead; 2 lb. White Lead in Oil; 1 lb. 85% Magnesia with Linseed Oil to make stiff putty	Laid between flanges of joints, using a lead wire as a shim	Resists hot alcohol vapors
80 lb. Litharge; 8 lb. Red Lead; 10 lb. Floc Asbestos; 1.5 gal. Linseed Oil	Hardens in about 7 days	Resists dilute nitric acid cold but not hot
Tar or Soft Pitch and Linseed Oil (50–50)	Applied hot	Does not harden; resists acids
Sulphur melted with Rosin Tar or Pitch	Melted in place	Resists hydrochloric acid

Silicate Cements—*Continued*

Composition	*Methods*	*Remarks*
Silicate of Soda and Barytes Flour	Make to a stiff paste	Resists wet chlorine
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f. 1 part Litharge; 1.5 parts Silica; 1.5 parts Portland Cement; Glycerol and more Silicate	Mix to a putty consistency	For sulphur dioxide gas (wet); resists hot solutions
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Rubber, Linseed Oil, Asbestos Fiber	Rubber is dissolved in hot oil and asbestos added to make a thick putty	For joints in stoneware, etc.; forms an elastic mass
Sulphur in various mixtures	Sulphur is melted and mixed with clay, silica, etc., to form a putty	Applied hot as a grouting; resists acids and alkalis
Self-vulcanizing Rubber Cement	Painted or trowelled in place	Resists both corrosion and abrasion
Numerous resin base proprietaries		Resist dilute acids
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Miscellaneous Cements—*Continued*

Composition	*Methods*	*Remarks*
Shellac (30); Rosin (20); Alcohol (33); Gypsum (2); Ferric Oxide (15)	Finely powdered solids are mixed with an alcoholic solution of the resins	Resists petroleum oils
2 parts Scotch Glue; 7 parts Water; 1 part Glycerol		For oil or gas leaks; more glycerol softens it

Non-Efflorescing Concrete

The addition of 5% Barium Carbonate to the cement prevents efflorescence.

Keying Plaster to Concrete

First secure a fast setting plaster which corresponds to Plaster of Paris, moulding plaster or something similar. This plaster is mixed thin enough so it can be whipped onto the wall with a brush. After this dash coat of plaster has thoroughly set, the wall, which now has a rough surface, may be plastered over in the usual way with ordinary gypsum plaster.

Plaster Cement, Patching
U. S. Patent 2,016,986

Calcium Carbonate (50–200 mesh)	4 lb.
Dry by heating below 600° C.	
Slaked Lime	5 lb.

Refrigerator Display Case Caulking Compound
U. S. Patent 1,974,745

Nitrocellulose	1– 7	oz.
Dibutyl Phthalate	15–60	oz.
Asbestine (Mineral)	30–90	oz.
Camphor	¼	oz.

Cement "Wash" Hardener

Portland Cement	20 lb.
Iron Filings	126 lb.
Water	9 lb.

Apply with brush, mixing often.

Concrete Wash, or Finish Paint
(Hard and Durable)

Slaked Lime	1 lb.
Cement	1 lb.

Mix in water containing ½ lb. salt per gallon to desired consistency.

Colored Caulking Cement
U. S. Patent 2,011,607

A cement of substantially permanent elasticity and which is adapted for application by a trowel or a grease gun consists of paracoumarone resin m.p. about 50–60° C. about 60, asbestos fiber about 20, a metallic oxide such as oxide of zinc or iron about 5 and xylol about 15%.

Pliable Glazing-Caulking Cement
British Patent 398,057

Formula No. 1

Mineral Filler	1–50 oz.
Oil	30 oz.
Asbestos Fiber	20– 1 oz.
Aluminum Powder	1–30 oz.

Varnish sufficient to make paste.

No. 2

Calcium Carbonate, Powdered	12.60 oz.
Magnesium Silicate, Powdered	17.10 oz.
Asbestos Fiber	5.45 oz.
Soya Bean Oil	30.63 oz.
Varnish	16.22 oz.
Aluminum Powder	9.00 oz.
Naphtha, Petroleum	9.00 oz.

Glazing Putty

Whiting, Domestic, 200 mesh	205 lb.
Whiting, Belgian	70 lb.
Linseed Oil, Raw	26 lb.
Japan Drier	1 lb.
Mineral Spirits	3 lb.

Cement for Pestle Handles

Heat the head of the pestle until it is too hot to hold in the hand. Pour melted shellac into the hole, then take the wooden handle, wind some twine around the screw portion, and press it "home." Keep under pressure until the head of the pestle is cold.

Mortar Cement

Fuse together, in an iron vessel, equal parts of guttapercha and shellac. This forms a powerful cement. Strongly heat the edges of the broken mortar, apply a thin layer of the cement to both frac-

tured surfaces, and put together under pressure.

Joining Stainless Steel in Knife Handles

Method 1

A waterproof cement is used, made by mixing finely powdered litharge and glycerin. The glycerin should be added in an amount equal in volume to half the volume of the powdered litharge and mixed thoroughly. The end of hollow handle is filled with cement and then insert the blade. Setting time about 45 minutes. Mix only enough cement as needed as it sets quickly becoming hard and insoluble.

Method 2

The stainless steel blade is first thoroughly tinned and then soldered in place. It is necessary to have all parts clean and free from scale. Solders used are either 50% tin and 50% lead or 66% tin and 34% lead. Flux used is made up of zinc chloride, commercial grade, 37 g.; glacial acetic acid 99.9%, 23 g.; hydrochloric acid (commercial), 34.5%, 40 g.

Metal Adhesive

Nitrocellulose Scrap	10 g.
Alcohol	26 g.
Ethyl Acetate	25 g.
Butyl Acetate	31 g.
Benzol	30 g.
Camphor	2 g.

To the viscous solution add:
Metal Powder enough to "hide"

Viscosity should be high enough to prevent the metal settling down.

Rubber to Metal Cement

British Patent 432,493

Paris White	40 oz.
Rosin	3 oz.
Dammar or Copal Gum	15 oz.
Benzol	15 oz.
Naphtha	23 oz.
Rubber	1½ oz.

Pyroxylin to Metal Adhesive

Pyroxylin	6 oz.
Gelatin	7 oz.
Acetic Acid, Glacial	87 oz.

Aluminum Foil to Leather or Paper Adhesive

U. S. Patent 1,925,903

Linseed Oil Fatty Acids	11.82 g.
Tung Oil	16.35 g.
Rosin	22.53 g.

Heat rapidly in aluminum vessel to 280° C.; cool to 260–265° C. and add with stirring:

Phthalic Anhydride	32.68 g.
Glycerin	16.35 g.
Ethylene Glycol	4.22 g.

Keep at 200–220° C. until clear; heat at 250° C. until a sample solidifies in 40 seconds at 200° C.

Take of the above resin and dissolve in:	11 g.
Acetone	11 g.
Dibutyl Phthalate	5 g.
Nitrocellulose "Solution" (½ second)	sufficient

Thermoplastic Cement

Nitrocellulose Wet 5–6 sec.	8 g.
DuPont Resin RH-35 6# cut	10 g.
Dibutyl Phthalate	4 g.
Methyl Ethyl Ketone	10 g.
Butyl Acetate	10 g.
Toluol	58 g.

Fusible Adhesive Cement

U. S. Patent 1,945,803

Chlorinated Naphthalene (Solid)	50 oz.
Ester Gum	50 oz.
Rubber Latex	5 oz.

Shellac Sealing Composition

Shellac	50 oz.
Beechwood Creosote	5 oz.
Ammonia (28%)	1 oz.
Terpineol	2 oz.

Adhesive Sealing Compound

(Universum)

Mix hot beeswax and Venice turpentine 1 to 1. Proportions may be varied according to needs. Can be colored if desired. This is very good to temporarily attach glass to iron or wood.

"Syndetikon" (Universal Adhesive)

a. Prepare Caustic Lime, Freshly Burned	100 g.
Water	50 g.

Let stand to cool: pour off layer of water. Use now:

Lime Hydrate (above)	15 g.
Sugar Solution (25%)	240 g.

Heat to 75° C., let stand stirring through from time to time, pour off the clear solution, of which

Lime-Sugar Solution	225 g.
Bone Glue	60 g.

are mixed to swell over night. Dissolve finally by warming up.

Acid Resisting Cement

Fine Sand	2 lb.
Short Fiber Asbestos	2 lb.
Magnesia	1 lb.

Sodium Silicate sufficient to make paste.

Aquarium Cement

Litharge	3 lb.
Fine White Sand	3 lb.
Plaster of Paris	3 lb.

Mix thoroughly. Then add linseed oil sufficient to make paste, and a small amount of drier.

Adhesive Foil
U. S. Patent 1,955,075

Acidify defibrinated blood at 40° C. with 0.5% lactic acid; mix with 2.3% ammonium sulphate solution; keep at 40° C. for 1–3 hours; render slightly alkaline and mix with 8–12% glycerin and 5% alum or synthetic tannins.

Adhesive for Casein Plastics
British Patent 411,058

Casein	1 part
Water	1 part
Urea	½–1 part

Quick Hardening Putties
German Patent 613,748

Formula No. 1

Aluminum Powder	30 g.
Nitrocellulose	14 g.
Butyl Acetate	21 cc.
Ethyl Ether	35 cc.

No. 2

Aluminum Powder	30 g.
Ethyl Cellulose	14 g.
Benzol	33.6 cc.
Ethyl Ether	22.4 cc.

Red Lead Putty

Red Lead, Dry	31 lb.
White Lead, Dry	48 lb.
Silica	16 lb.
Raw Linseed Oil	1 gal.

Slate Color Putty

Whiting	24 lb.
White Lead, in Oil	70 lb.
Lampblack, Dry	2 oz.
Raw Linseed Oil	6 lb.

White Putty

Whiting	77 lb.
White Lead, in Oil	9 lb.
Raw Linseed Oil	14 lb.

Black Plastic Putty

"D" Asphaltum (Soft)	400 lb.
Gilsonite	100 lb.
Black Fish Oil	7 gal.
Crude Black Oil	7 gal.
Stove Distillate	70 gal.

Directions:

Melt the two blacks to 550° F. and hold until in complete solution, then add both oils and heat to 575° F. Cool to 450° and reduce.

The black fish oil is a very dark crude and cheap oil, unfiltered and full of stearines.

For overglazing where the lights of glass overlap, a semi-liquid coating is made by mixing into the base vehicles while hot ¾ lb. of long-fiber asbestos to each gallon.

For the plastic putty for cementing the glass to the frame, the following mixture is made in a regular pony chaser:

Base Vehicle (above)	5 gal.
Stove Distillate	1½ gal.
"Asbestine"	50 lb.
Long-fiber Asbestos	5 lb.

This product is stiff and must be applied by knifing or with a small trowel.

In the east and south cement slabs called cementiles are quite commonly used in constructing factory roofs. The joints of these tiles are first partly filled in with a non-shrinkable cement, and above this flush with the tile surface is run a waterproof expansive plastic for protection. An eastern manufacturer of cementile roofing slabs also makes the joint cement or putty. They buy large quantities of paint skins from paint manufacturers, and use this as the base material, cooking the same with an addition of fish oil, subsequently churning it with such filling material as asbestine or whiting, short asbestos fiber, and red oxide for color. The final protective is a well-known commodity, trade name similar to "mud mud." Its salient features are: a soft but firm plasticity; a condition of slime for easy slip in trowelling; slow setting during manipulation, but later becomes surface-set out of dust and dirt; retains its softness and cohesiveness within the joint, indefinitely. These features have been very well reproduced in the following formulation:

5% Leaded Zinc Oxide	24 lb.
Borate of Manganese	½ lb.
Spanish Red Oxide	8 lb.
Treated China Wood Oil	4 gal.
Sulphurized Fish Oil	4 gal.
Medium Body Gloss Oil	4 gal.
"C" Asbestos Fiber	32 lb.

The prepared oil is 40 lb. of limed rosin and 20 gal. of wood oil heated to 425° F. and held there about 2 hours until very heavy—but no stringing; then reduced immediately with 50 gal. kerosene.

The above plastic is run into the tile joints with a hand-pressure caulking and glazing gun, fitted with either the standard or the extra large caulking nozzle.

Although akin to putty but more properly termed otherwise, is that compound familiarly known by almost everyone as Litharge-Glycerin Cement, which is valuable for a number of purposes for which ordinary cement and putty would be neither practicable nor desirable. Probably all readers may feel that they know how to mix this cement for usage, but those who merely combine these two ingredients really would not be doing it efficiently for best results. The cement is correctly produced by adding to a mixture of 5 parts of 95%-pure glycerin and 3 parts of water, sufficient finely ground litharge to form a plastic of any required consistency. Variation in the amount of water will influence the time of setting and to an extent the general characteristics, but all modification within the range of say 1 to 3 parts of water with 5 or 6 parts of glycerin will attain satisfactory hardness. Its normal hardening time is about ten minutes, but it may be made to remain soft for a longer period by an addition of ten per cent of inert material such as silica, iron oxide, or fuller's earth. Such admixtures do not detract from the ultimate hardening or strength, but also are beneficial in preventing possible cracking. Litharge-Glycerin Cement will withstand a high degree of combined heat and moisture. A very common usage is for forming water-tight connections between iron pipes and porcelain fittings; and for cementing glass aquariums, etc. Its most conspicuous feature is its resistance to practically all acids not of full strength. It is used to good advantage in temporarily sealing leaks at seams, around the bottoms, and around flanges, etc., of storage tanks filled with varnish; these temporary repairs have held until the contents of the tanks were used when a permanent repair could be made.

Marine Putty, to harden under water, may be made from the formulation here given:

Hydraulic Cement	30	lb.
Plaster of Paris	7½	lb.
Litharge	10	lb.
Belgium Whiting	20	lb.
Lead Carbonate (Dry)	10	lb.
Boiled Linseed Oil	3	gal.

On the seaboard, hydraulic cement is better known as sea-water cement. This type differs from regular Portland cement for land construction in being darker color and containing a minimum of tri-calcium aluminate . . . the constituent in cement which is rapidly attacked by (saline) sea water. Whereas regular cement contains 10–15% tri-calcium aluminate, this is minimized to 2% in sea-water cement.

Painters' Lead Putties, also termed Hard Putty and Carriage Putty, will vary in lead content from almost straight lead to approximately 75 per cent and 50 per cent; the admixtures being whiting and/or silica. Typifying the first two, are the formulas below of hard putties actually used in railroad shops:

Dry White Lead	90 lb.	50 lb.
White Lead in Oil	—	20 lb.
Whiting	—	25 lb.
Silex	6 lb.	—
Boiled Linseed Oil	3/16 gal.	—
Gold Size Japan	3/16 gal.	¾ gal.
Rubbing Varnish	1⅛ gal.	¾ gal.

These mixtures are allowed to stand 72 hours to thoroughly wet down and sweat, and then kneaded up into putty. The silex used is the live quartz silica mainly adopted for the making of paste wood fillers. The pigmentation of a representative painters' hard putty with lower lead content would be 50% dry white lead, 35% whiting and 15% silica.

A non-shrinkable type of putty containing about 20% of lead in the pigment is this:

Whiting	125	lb.
White Lead, Dry	37½	lb.
Silica	12½	lb.
Raw Linseed Oil	3½	gal.
Flour Paste	10¼	lb.

The flour paste is 2 lb. of wheat flour beaten up in about 1 quart of cold water and then poured into 3 quarts of boiling water, and boiled 5 minutes. Yield 10¼ lb. net.

The foregoing non-shrinkable putty is very similar to what used to be known as Swedish putty, purported to be so excellent for wood, iron, or stone. Another type of Swedish Putty without lead, is the following:

Rye Flour	2	lb.
Cold Water	½	gal.

Beat together, then pour into

Boiling Water	1	gal.

Cook 5 minutes, let cool, then stir into it

Whiting	20	lb.

Whiting	50	lb.
Gold Size Japan	2	gal.
Raw Linseed Oil	1	gal.

Grind in a paint mill.

Combine the two parts in a pony chaser, and thicken with more whiting to the required plasticity for knifing. This batch produces 100 lb. net.

Metal Furniture Baking Putty

Bolted Whiting mixed with	5 lb.
Boiled Linseed Oil then	1 pt.
Flour Paste	1 pt.

Mix all very thoroughly. The flour paste is as given for non-shrinkable putty. In all cases of preparing flour pastes, the flour and cold water should be beaten until entirely free from lumpiness; and during the subsequent cooking, should be continually stirred.

Stopping Putty is a dry mixture of 2 lb. of "Alabastine," 1 lb. of wheat flour, and 1 lb. of Portland Cement. When ready to use, 1 pound of this mixed powder should be thoroughly worked up to a stiff putty with 8 fluid ounces (½ pint) of cold water. This putty sticks to stone, wood, brick, etc.; used for filling knot holes, cracks, etc. Keep the dry powder in an air-tight jar.

Gesso Duro is Italian hard plaster used in making bas-relief casts. When dried, it becomes very hard and durable.

This product, per formula, below, remains soft and manipulable for quite a period of time, using a small trowel, spatula or by forming with the hands:

LePage's Fish Glue	4	gal.
Water, to reduce it	1	gal.
Oil of Lavender	6	fl. oz.
Raw Linseed Oil	1	gal.
Bolted Danish Whiting	50	lb.
Rubbing Varnish	1	gal.
Bolted Danish Whiting	20	lb.

(colors in oil may be added, if shading is desired)

Plastic Wood Dough

*Gum Solution	1 gal.
Glycerin	3 pt.
Butyl Alcohol	3 pt.
Whiting	8 lb.
Wood Flour	24 lb.
Dope (Solution)	8 gal.

*The "gum" solution is 16 pounds of gum rosin (WW Rosin) cold-cut (dissolved) in 1 gallon of methyl acetone; the "dope" is another cold-cut solution, basis of 1 pound of "movie"-film scrap to each gallon of methyl acetone. The picture film scrap should be desilvered by washing in hot water to remove its gelatin coating and then laid out in the sun and air to dry; but preferably it is obtainable cleaned and ready for cutting.

Onyx Cement

The above wood dough product is a soft workable putty easily applied to all kinds of depressions to be surfaced up. The work or job should not be left in too-rough state because the putty dries and hardens very rapidly; the ultimate sanding down later is a rather tough job unless the puttying had been reasonably smoothly applied.

There is one putty specially used in fair quantity, which is very little known in regular paint circles. This is termed *Onyx Cement* because its specific utility is for bonding slabs of onyx, marble, glass, and their imitations, to the walls in public buildings. It is necessarily of rather firm plasticity because of the weight it must partially support. Uniform handfuls of the putty are attached to the wall foundation at intervals about 18 to 24 inches apart; the slabs mentioned are then stood upright on their base, and then pressed back steadily and firmly into the mounds of putty. Suction, and the adhesive strength of the putty, securely hold the marble and glass permanently in place. The same material, plain or colored, is embedded in the joints between the slabs. The composition of this putty follows:

Domestic Whiting, 350 Mesh	100	lb.
Domestic Whiting, 200 Mesh	100	lb.
"Super-Sublimed" White Lead	40	lb.
White Oil Drier	1¼	gal.
Bodied Linseed Oil	1¼	gal.
Boiled Linseed Oil	2½	gal.

For certain work a *Black Onyx Cement* is used. This is produced on a bituminous base.

Another specialty probably even less known than the onyx putties . . . in paint circles, is a *Black Packing Compound* required by makers of corrugated iron culverts. These culverts are sturdy Armco-iron corrugated pipe, galvanized, in sizes from 12 to 84 inches diameter. They are the aqueducts for streams crossing the highways and for surface-sewers under driveways in rural districts, etc. There is first applied hot a thoroughly-

tested bituminous mastic pavement along the line of flow where erosion is greatest . . . approximately the lower one-quarter or one-third of the inside circumference. This coating practically fills the valleys of the corrugations and to the extent of building up a thickness of perhaps ¼-inch over the rises.

For this purpose the culvert manufacturer supplies a plastic for cold application. The composition is 3 parts by weight of sawdust and 1 part asbestos fiber, thoroughly churned together with enough coal tar solution to form a putty that may be applied by hand to the abraded spots in the paved section of the culvert.

The last unusual specialty to be mentioned is *Sheet Metal Deadener.* Two eastern manufacturers have been supplying during the past three or four years a plastic compound developed for sound-deadening sheet metal equipment, principally metal furniture and automobile parts. This became most essential with the advent of the closed body, to eliminate rumble and vibratory noises, and especially the ''tinny'' sound caused by closing the doors. It is a standard application on Ford, Auburn, Stutz, Marmon, Duesenberg, and Nash cars; and probably on many others. The material might be described as a very soft bituminous plastic apparently containing fine asbestos fiber or other filler; it surfaces dust free very quickly, has excellent adhesion and undoubtedly maintains flexibility indefinitely. As general practice, it is applied onto the inner surfaces of the auto body and doors, or other object, to a thickness of approximately ¼-inch, using a trowel, broad knife, or spatula. This sets in less than 30 minutes, but soft; is firm in 1½ hours and still somewhat soft, is solid in 4 hours but not hard; and shrinks down somewhat in solidifying. For large production as by body builders and in the auto plants, the material has sufficient ''slip'' so it can be sprayed with special equipment.

High grade cork paint films insulate surfaces against heat, cold, and moisture, also deaden sound and soften the effect of shocks and blows, rendering them valuable for use on automobiles, railroad cars, and aeroplanes. In the automobile industry they are employed to advantage on the lower sides of the engine bonnets and mud guards. Applied to the bonnets, they protect the outside lacquer films against the radiating heat of the motor; while the cork paint films on the lower sides of the mud guards protect the latter against the impact of stones, sand, etc. Applied to the surfaces of aeroplane cabins, they form a rather effectual insulation against the noise of the motors.

Marine Paints

Marine paints differ from house paints chiefly in that harder pigments are required. This means that such pigments as zinc oxide and iron oxide are used more extensively in marine paints than in house paints. Since steel vessels have largely replaced wooden vessels in seagoing traffic, the formulas shown herein are for the preservation and beautification of steel rather than wood. On steel the priming coat of paint—that is, the paint applied first on the metal—is of more importance than the priming coat on wood. The service to which marine paints are exposed is much more severe than that to which house paints are exposed. To meet this condition the various parts of the vessel must be considered separately. The paints suitable for the parts seen from the outside when the vessel is afloat are quite different from the paints suitable for underwater portions of the vessel. The paints suitable for inboard bulkheads are quite different from those suitable for inner bottoms or bilges, etc.

An excellent priming paint for steel surfaces to be exposed to the atmospheric elements is made from the following formula which produces one gallon and spreads approximately 650 sq. ft. per gallon:

Red Lead, Dry	20 lb.
Raw Linseed Oil	5 pints
Petroleum Spirits	2 gills
Paint Dryer	2 gills

Paint from the above formula should be used within a month after it is mixed. If allowed to stand in closed (or open) containers for an appreciably longer period, the pigment settles hard and cannot be again stirred to proper consistency for painting. By using very finely ground red lead pigment which contains 99 per cent true red lead, it is possible to successfully store the paint through periods of approximately one year. However, if the paint is to be stored during such period, or longer, formulas such as the following should be used:

Red Lead, Dry	1 lb.	11 oz.
Zinc Oxide, Dry		13 oz.
Venetian Red, Dry	4 lb.	2 oz.
Magnesium Silicate, Dry		10 oz.
Spar Varnish	2 lb.	
Raw Linseed Oil	2 lb.	7 oz.
Petroleum Spirits		9 oz.
Paint Drier		14 oz.
Aluminum Stearate		1 oz.

Films from paints of the above formulas interfere with the adhesion of shipbottom paints, so these paints should not be used on the outside underwater portion of the hull. If it is desired to prevent corrosion on that portion of the vessel during construction, a weaker film paint should be used, such as:

Metallic Brown, in Oil	7.5 lb.
Raw Linseed Oil	2.3 lb.
Spar Varnish	.3 lb.
Gasoline	.6 lb.

or

Metallic Brown, Dry	4.0 lb.
Spar Varnish	4.4 lb.
Paint Drier	2.5 lb.

The above two formulas are also suitable for a paint to be used on freshly pickled steel to protect it during fabrication; that is, as shop coat or field coat paints.

Aluminum paint may be used in lieu of red lead paint, for priming steel, but should not be used on underwater portions of the vessel. Its bright luster aids inspection of the interior of vessels under construction, but in warm, humid climates it does not prevent rust as does red lead paint. The formula is:

Aluminum Powder	2 lb.
Aluminum Mixing Varnish	1 gal.

Note: This paint should be used within a few hours after mixing.

While priming paints will give fair protection when used alone, they are designed to be covered with at least two coats of finishing paint. Unlike house paints, there is no advantage in using a different formula for the first and the second coat of marine finishing paint. Following are formulas for ten gallons of finishing paints—on surfaces not to be exposed underwater:

Outside White Paint

Titanox B, in Oil	85 lb.
Zinc Oxide, in Oil	36 lb.

Ultramarine Blue, in Oil	.5	oz.
Raw Linseed Oil	30	lb.
Petroleum Spirits	3	lb.
Paint Drier	8	lb.

or

White Lead, in Oil	53	lb.
Zinc Oxide, in Oil	95	lb.
Raw Linseed Oil	25	lb.
Petroleum Spirits	7	lb.
Paint Drier	5	lb.
Ultramarine Blue, in Oil	1	oz.

Outside Black Paint

Lampblack, in Oil	38	lb.
Raw Linseed Oil	32	lb.
Paint Drier	14	lb.

or

Lampblack, Dry	4	lb.
Spar Varnish	44	lb.
Petroleum Spirits	4	lb.
Paint Drier	18	lb.

Inside White Paint

Titanox B, in Oil	76	lb.
Zinc Oxide, in Oil	51	lb.
Raw Linseed Oil	4.5	lb.
Damar Varnish	8	lb.
Petroleum Spirits	20	lb.
Paint Drier	4	lb.
Ultramarine Blue, in Oil	.5	oz.

or

White Lead, in Oil	77	lb.
Zinc Oxide, in Oil	77	lb.
Raw Linseed Oil	18	lb.
Petroleum Spirits	15	lb.
Paint Drier	34	lb.
Ultramarine Blue, in Oil	.5	oz.

Light Gray Paint

Titanox B, in Oil	50	lb.
Zinc Oxide, in Oil	35	lb.
Lampblack, in Oil	1	lb.
Ultramarine Blue, in Oil	¾	lb.
Raw Linseed Oil	39	lb.
Petroleum Spirits	1.5	lb.
Paint Drier	8	lb.

Outside Green Paint

Chrome Green, Dry	30	lb.
Zinc Oxide, Dry	10	lb.
Chrome Yellow, in Oil	3.6	lb.
Yellow Ochre, Dry	7.5	lb.
Lampblack, in Oil	6	lb.
Spar Varnish	35	lb.
Petroleum Spirits	16	lb.
Paint Drier	4	lb.

Inside Flat White Paint

Zinc Oxide, in Oil	157	lb.
Petroleum Spirits	23	lb.
Paint Drier	4	lb.
Ultramarine Blue, in Oil	.5	oz.

Inside White Enamel

Titanox B, Dry	25	lb.
Zinc Oxide, Dry	25	lb.
Damar Varnish	68	lb.
Pine Oil	6	lb.
Ultramarine Blue, in Oil	.5	oz.

To this white enamel may be added color pigments, ground in oil or in varnish, to produce desired shades. By adding additional pine oil just before applying, the enamel is made to brush on much easier. An enamel will not adhere well over an enamel or glossy finish. If two coats are to be applied, the first coat should be a flat paint.

Outside Buff Paint

White Lead, in Oil	125	lb.
Yellow Ochre, in Oil	14	lb.
Venetian Red, in Oil	5	lb.
Raw Linseed Oil	27	lb.
Petroleum Spirits	7	lb.
Paint Drier	4	lb.

Inside Semi-flat Light Green Paint

Titanox B, Dry	65	lb.
Zinc Oxide, Dry	30	lb.
Chrome Green Oxide, in Oil	7	oz.
Damar Varnish	39	lb.
Petroleum Spirits	20	lb.

Inside French Gray Enamel

Titanox B, in Oil	72	lb.
Lampblack, in Oil	1	lb.
Chrome Yellow, in Oil	1	lb.
Spar Varnish	30	lb.
Damar Varnish	29	lb.
Pine Oil	6	lb.

Piping, ducts, gas cylinders, etc., aboard vessels are usually marked with colors to indicate the purpose served or the contents. Formulas for such paints are:

Red Paint

Toluidine, Dry	7 lb.
Spar Varnish	73 lb.

Blue Paint

White Lead, in Oil	106 lb.
Ultramarine Blue, in Oil	26 lb.
Raw Linseed Oil	22 lb.
Petroleum Spirits	8 lb.
Paint Drier	4 lb.

Green Paint

Chrome Green, in Oil	97 lb.
Raw Linseed Oil	21 lb.
Petroleum Spirits	9 lb.
Paint Drier	5 lb.

Black Paint

Lampblack, in Oil	70 lb.
Petroleum Spirits	9 lb.
Paint Drier	10 lb.

Brown Paint

Metallic Brown, in Oil	100 lb.
Raw Linseed Oil	27 lb.
Petroleum Spirits	8 lb.
Paint Drier	3 lb.

Yellow Paint

Chrome Yellow, in Oil	116 lb.
Raw Linseed Oil	20 lb.
Petroleum Spirits	9 lb.
Paint Drier	3 lb.

The above red and green paints are suitable for the stands on which running lights are mounted, red marking the port side and green the starboard side.

Single shell smoke stacks become too hot for any of the above paints. Such surfaces should be painted with special paints, the following formulas being typical:

Light Gray Paint

White Lead, Dry	48 lb.
Zinc Oxide, Dry	19 lb.
Litharge, Dry	3.5 lb.
Lampblack, in Oil	.5 lb.
Ultramarine Blue, in Oil	.5 lb.
Damar Varnish	20 lb.
Kerosene	33 lb.
Paint Drier	6 lb.
or	
Titanox B, Dry	60 lb.
Interior Varnish	52 lb.
Lampblack, in Oil	2 lb.
Petroleum Spirits	9 lb.

Red Paint

Indian Red, Dry	40 lb.
Interior Varnish	55 lb.
Paint Drier	15 lb.

Buff Paint

White Lead, Dry	55 lb.
White Lead, in Oil	55 lb.
Silica	18 lb.
Yellow Ochre, in Oil	13 lb.
Litharge, Dry	12 lb.
Venetian Red, in Oil	.5 lb.
Boiled Linseed Oil	23 lb.
Petroleum Spirits	15 lb.

Green Paint

Chrome Green, Dry	30 lb.
Lampblack, in Oil	2 lb.
Interior Varnish	60 lb.
Paint Drier	10 lb.

Black Paint

Drop Black, Dry	38 lb.
Interior Varnish	48 lb.
Paint Drier	16 lb.

The waterline area on the outside of the hull is generally regarded as the most difficult part of the vessel to keep properly painted. This is because it is subjected to both atmospheric and underwater exposure, and paints suited to the one exposure are not suited to the other. A high grade varnish paint applied over red lead primer gives as good service on this area as has been obtained. Typical of waterline paints are:

Red Paint

Venetian Red, Dry	29 lb.
Spar Varnish	42 lb.
Petroleum Spirits	7 lb.
Paint Drier	18 lb.

Light Gray Paint

Zinc Oxide, Dry	30 lb.
Lampblack, in Oil	8 lb.
Ultramarine Blue, in Oil	12 lb.
Spar Varnish	31 lb.
Petroleum Spirits	17 lb.
Paint Drier	18 lb.

Black Paint

Drop Black, in Oil	20 lb.
Zinc Oxide, Dry	19 lb.
Spar Varnish	20 lb.
Petroleum Spirits	20 lb.
Paint Drier	17 lb.
or	
Lampblack, Dry	8 lb.
Zinc Oxide, in Oil	20 lb.
Spar Varnish	38 lb.
Petroleum Spirits	7 lb.
Paint Drier	18 lb.

Shipbottom paints are used to prevent rust and to prevent the attachment of marine fouling on the bottoms of vessels. The "anti-corrosive" paint is to prevent rust and is applied next to the steel. The "anti-fouling" paint is to prevent the attachment of barnacles, algae, and other forms of fouling. It contains material toxic to marine organisms, and is applied over the anti-corrosive paint. Both paints should be quick drying paints. Each of the two paints is so dependent on the

other that the two formulas are shown together. The anti-corrosive paint of one set should not be used with the anti-fouling paint of another set. The following formulas are typical:

Anti-corrosive Paint

Gum Shellac	8 lb.
Denatured Alcohol	54 lb.
Zinc Oxide, Dry	29 lb.
Zinc Dust	11 lb.
Pine Oil	5 lb.

Anti-fouling Paint

Gum Shellac	14 lb.
Denatured Alcohol	45 lb.
Zinc Oxide, Dry	14 lb.
Indian Red (Iron Oxide)	15 lb.
Mercuric Oxide	8 lb.
Pine Oil	9 lb.

Anti-fouling Paint, shown above, is used with the Anti-corrosive Paint shown above.

Anti-corrosive Paint

Zinc Oxide, Dry	19 lb.
Venetian Red, Dry	9 lb.
Silica	9 lb.
Rosin (WW Grade)	15 lb.
Solvent Naphtha	28 lb.
Manganese Linoleate	13 lb.
Coal Tar	5 lb.

Anti-fouling Paint

Zinc Oxide, Dry	24 lb.
Asbestine, Dry	7 lb.
Silica	8 lb.
Cuprous Oxide	15 lb.
Mercuric Oxide	4 lb.
Rosin (WW Grade)	25 lb.
Solvent Naphtha	34 lb.
Pine Oil	4 lb.
Coal Tar	6 lb.

The steel decks should be primed with red lead paint and finished with two coats of one of the following deck paints:

Black Deck Paint

Lampblack, Dry	4 lb.
Spar Varnish	44 lb.
Petroleum Spirits	5 lb.
Paint Drier	18 lb.

Gray Deck Paint

Zinc Oxide, Dry	33 lb.
Lampblack, Dry	6 lb.
Ultramarine Blue, in Oil	¼ lb.
Spar Varnish	74 lb.
Paint Drier	1 lb.

Red Deck Paint

Red Lead, Dry	10 lb.
Indian Red (Iron Oxide), Dry	25 lb.
Aluminum Stearate	2 lb.
Lampblack, in Oil	2 lb.
Spar Varnish	44 lb.
Paint Drier	18 lb.

Note: Since this paint contains red lead it can be applied directly on the steel deck; that is, no red lead primer is necessary.

Black Anchor Chain Paint

Gilsonite	7 lb.
Rosin	5 oz.
Petroleum Residuum	21 lb.
Solvent Naphtha	47 lb.

Green Anchor Chain Paint

Chrome Green, in Oil	10 lb.
Red Lead, Dry	10 lb.
Aluminum Powder	5 lb.
Asphaltum Varnish	4 gal.
Boiled Linseed Oil	2 gal.
Spar Varnish	2 gal.
Petroleum Spirits	2 gal.
Paint Drier	½ gal.

Shellacs are used to brighten up wood work on marine vessels. The following are ten gallon formulas:

	Orange (clear)	Red Shellac	Green Shellac
Gum Shellac	24 lb.	27 lb.	27 lb.
Wood or Denatured Alcohol	55 lb.	48 lb.	53 lb.
Venetian Red (Iron Oxide)	—	17 lb.	—
Chrome Green, Dry	—	—	15 lb.
Drop Black, Dry	—	—	15 lb.

Bilge and Tank Paints

Black Flexible Paint

Petroleum Residuum	34 lb.
Rosin	7 lb.
Petroleum Spirits	29 lb.
Coal Tar Naphtha	6 lb.

Black Acid-Resisting Paint

Petroleum Residuum	20 lb.
Paving Asphalt	15 lb.
Lampblack, Dry	5 lb.
Beeswax	2½ lb.
Petroleum Spirits	39 lb.
Paint Drier	5½ lb.

Bituminous Enamel

Petroleum Residuum	80 lb.
Paving Asphalt	10 lb.
Asbestos Fiber	5 lb.

Note: This product must be heated for application.

Potable Water Tank Paint

Metallic Brown, Dry	40 lb.
Indian Red, Dry	15 lb.
Zinc Oxide, Dry	8 lb.
Silica	8 lb.
*Amberol Varnish	54 lb.
Petroleum Spirits	3 lb.
Paint Drier	3 lb.

*Amberol Varnish for Above Formula.

Amberol Gum No. 226	10 lb.
Raw Tung Oil	35 lb.
Petroleum Spirits	39 lb.
Cobalt Drier	¾ lb.

Black Tank Paint

Petroleum Residuum	12½ lb.
Litharge	1¾ lb.
Red Lead	1¼ lb.
Rosin (D Grade)	¼ lb.
Lampblack, Dry	5½ lb.
Boiled Linseed Oil	12 lb.
Spar Varnish	14 lb.
Damar Varnish	4 lb.
Petroleum Spirits	32½ lb.

Brown Tank Paint

Metallic Brown, Dry	40 lb.
Litharge	2 lb.
Zinc Oxide, Dry	16 lb.
Zinc Chromate, Dry	2 lb.
Damar Varnish	46 lb.
Interior Varnish	11 lb.
Paint Drier	15 lb.

Primer for Bituminous Enamel

Trinidad Asphalt	53 lb.
Petroleum Spirits	6⅜ gal.

Bituminous Enamel

Paving Asphalt	52 lb.
Trinidad Asphalt	15 lb.
Rock Asphalt	15 lb.
Rosin (Dark Grade)	1 lb.
Portland Cement	17 lb.
Slacked Lime	2½ lb.

Note: This product must be heated before applying.

Paint Driers

Manganese Resinate	10 lb.
Damar Gum	10 lb.
Litharge	2 lb.
Raw Linseed Oil	8 lb.
Petroleum Spirits	49 lb.

Cobalt Paint Drier

Cobalt Acetate	5 lb.
Rosin Ester Gum	15 lb.
Raw Linseed Oil	19 lb.
Petroleum Spirits	39 lb.

Asphaltum Varnish

Paving Asphalt	35 lb.
Manganese Resinate	7 lb.
Litharge	1 lb.
Raw Linseed Oil	5 lb. 5 oz.
Petroleum Spirits	39 lb.

Damar Varnish

Batavia Damar Gum	47 lb.
Turpentine	22 lb.
Petroleum Spirits	21 lb.

Copper Paint for Wood Bottoms

Gum Shellac	16 lb.
Denatured Alcohol	50 lb.
Zinc Oxide, Dry	16½ lb.
Indian Red, Dry	16½ lb.
Cuprous Oxide	8 lb.
Pine Oil	9 lb.

Anti-Fouling Waterline Paint

Gum Shellac	13 lb.
Denatured Alcohol	5 gal.
Pine Oil	3 gal.
Crude Rubber	1 oz.
Gasoline	2 gills
Zinc Oxide, Dry	5 lb.
Lampblack, Dry	4 lb.
Mercuric Oxide	4 lb.
Turpentine	2 lb.

White Water Paint

Zinc Oxide, Dry	24 lb.
Whiting, Dry	48 lb.
Plaster Paris	24 lb.
Pulverized (Hide) Glue	4 lb.
Ultramarine Blue, Dry	1 oz.

Note: Mix 8 lb. of the above mixture in one gallon of water.

White Enamel

Titanox B, Dry	72 lb.
Spar Varnish	28 lb.
Damar Varnish	29 lb.
Pine Oil	6 lb.
Ultramarine Blue, in Oil	1 oz.

Gray Enamel

Titanox B, Dry	60 lb.
Lampblack, in Oil	2 lb.
Interior Varnish	53 lb.
Petroleum Spirits	9 lb.

Red Enamel

Indian Red, Dry	40 lb.
Interior Varnish	55 lb.
Paint Drier	9 lb.
Petroleum Spirits	6 lb.

Outside White Paint

Zinc Oxide, in Oil	50	lb.
Basic Sulphate White Lead, in Oil	50	lb.
Blanc Fixe, in Oil	12	lb.
Asbestine, in Oil	6	lb.
Raw Linseed Oil	4	gal.
Petroleum Spirits	¾	gal.
Paint Drier	½	gal.
Ultramarine Blue, in Oil	1	oz.

Red Lead Paint

Red Lead, Dry	85	lb.
Silica	40	lb.
Raw Linseed Oil	6¼	gal.
Petroleum Spirits	⅝	gal.
Paint Drier	⅝	gal.

Light Gray Paint

Zinc Oxide, Dry	34	lb.
Blanc Fixe, Dry	34	lb.
Graphite, Dry	2	lb.
Lampblack, in Oil	1	oz.
Ultramarine Blue, in Oil	1	oz.
Raw Linseed Oil	6⅝	gal.
Petroleum Spirits	1	gal.
Paint Drier	¾	gal.

The formulas shown require that the pigments in oil be stiff pastes. The percentages of raw linseed oil present are within the limits shown:

	% Linseed Oil in Paste
White Lead (Carbonate)	8 to 10
White Lead (Sulphate)	8 to 10
Zinc Oxide	8 to 18
Titantium Pigment B	15
Chrome Green	33 to 35
Chrome Oxide, Green	29 to 31
Chrome Yellow	24 to 26
Metallic Brown	22 to 24
Lampblack	65 to 80
Raw Sienna	45 to 55
Burnt Sienna	40 to 50
Raw Umber	35 to 45
Burnt Umber	30 to 50
Yellow Ochre	30 to 40
Magnesium Silicate	20 to 30
Venetian Red	20 to 25

Black Marine Paint

Carbon Black	15 lb.
Kaolin	25 lb.
Barytes	35 lb.
Boiled Linseed Oil	10 lb.

Red Paint

Indian Red	5 lb.
Barytes	1 lb.
Whiting	1 lb.
Linseed Oil	2 lb.
Japan Drier	6 oz.
Mixing Varnish	5 lb.

Surfacer

Varnish	1 gal.
Brown Japan	1 gal.
Silex (Fine)	8 lb.

Ship Bottom Paints

1. For Wood Bottoms

In any formulation, the object should be, first, to produce a mixture which will best serve the purpose and, second, to obtain the mixture at the lowest cost. The work requires a knowledge of a wide range of materials, their chemical and physical properties, and their cost. It also requires a knowledge of paint manufacturing operations, especially those to which the equipment on hand is adapted. Formulating is not an exact science any more than is the prescribing of medicine by the physician. One important difference between the physician writing a prescription and a paint technologist prescribing a paint formula is that the latter is also thinking about the cost.

The requirements of a paint for wood bottoms are comparatively simple and easy to meet. The corrosion problem does not enter, and consideration of a possible chemical or physical conflict with a priming paint does not enter. The object is to produce a paint, the film of which will brush (or spray) on easily, will dry quickly, will be resistant to water erosion and yet sufficiently softened by the water to permit the toxic elements to go into solution. There are several ways of approaching the problem which can best be illustrated by used formulas.

Formula No. 1

Iron Oxide	18	lb.
Silica	5	lb.
Copper Cyanide	13.5	lb.
Spar Varnish	7.25	gal.
Pine Tar Oil	.625	gal.
Paint Drier	.23	gal.
"Tar Acid Oil"	.30	gal.
Mineral Spirits	.25	gal.

(Comment: The above formula will doubtless "dry" in about four hours because the spar varnish, which usually requires about twelve hours to dry, has been overloaded with the added driers.

The dried film will be glossy and apparently hard, but it will probably not dry hard because of the excessive pine tar oil. The toxicant, copper cyanide, is regarded as only fairly toxic. This fact, together with the fact that a spar varnish film usually disintegrates under sea water and fouls readily, suggests that the film will not prevent barnacle fouling for a longer period than two or three months.)

Following is a formula which has given very good service:

No. 2

Blanc Fixe	40 lb.
Mercuric Oxide	5 lb.
Paris Green	7.5 lb.
Gum Shellac	20 lb.
Denatured Alcohol	5.9 gal.
Pine Oil	2.5 gal.

(Comment: The above formula is typical of shellac type paints. This paint will be effective about six months on a wooden bottom. It probably will not stand long storage satisfactorily, the nature of the pigment being such as to suggest a very hard sediment forming).

The U. S. Navy used a formula similar to the above.

No. 3

Zinc Oxide	165 lb.
Indian Red	165 lb.
Cuprous Oxide	75 lb.
Gum Shellac	162 lb.
Alcohol	500 lb.
Pine Oil	90 lb.

2. For steel bottoms.

In successfully formulating paints for steel bottoms the maximum ingenuity of the paint technologist is required. There are wide variations of opinions among men engaged in this work and each opinion is based, more or less, on experience in research. In designing paints for exposure to atmospheric elements there are certain fairly well established rules as to pigment-vehicle ratios by weight and by volume. For an oil paint for outdoor exposure, the pigment should be about 60 per cent by weight, and about 29.5 per cent by volume, of the paint. No such rules have been, or can be, established for ship bottom paints. Such ratios vary with each change in the vehicle, and there are an almost infinite number of such changes that can be made. The setting of high and low limits for the variants is apparently useless.

Before considering the varnish type of paints, which general type constitute the bulk of ship bottom paints used in America, the hot plastic paints, such as are used extensively in European countries, will be considered. Following are formulas used about twelve years ago by one of the European Navies.

Anti-corrosive Paint

Rosin	26.5 lb.
Benzol	26.5 lb.
Ozokerite	5 lb.
Iron Oxide	42 lb.

Anti-fouling Paint

Rosin	38.6 lb.
Stearin	14.7 lb.
Benzol	12.8 lb.
White Lead	7.4 lb.
Verdigris	9.6 lb.
Arsenic	13.2 lb.
Mercuric Oxide	3.7 lb.

To illustrate the varnish type ship bottom paints, two sets of paints used by the United States Navy are shown.

Anti-corrosive Paint

Formula No. 1

One Gallon Formula

Zinc Oxide	3.05 lb.
Zinc Dust	1.1 lb.
Gum Shellac	.425 lb.
Yacca Gum	.44 lb.
Alcohol	.8 gal.
Pine Oil	.067 gal.

No. 2

Coal Tar	47.5 lb.
Rosin	145 lb.
Coal Tar Naphtha	380 lb.
Magnesium Linoleate	129 lb.
Venetian Red	93 lb.
Zinc Oxide	186 lb.
Silica	93 lb.
Beeswax	3.3 lb.

Anti-Fouling Paint

Formula No. 1

One Gallon Formula

Zinc Oxide	1.65 lb.
Indian Red	1.65 lb.
Mercuric Oxide	.75 lb.
Gum Shellac	.815 lb.
Yacca Gum	.89 lb.
Alcohol	.76 gal.
Pine Oil	.125 gal.

No. 2

Coal Tar	132.6 lb.
Rosin	202.0 lb.
Coal Tar Naphtha	228.0 lb.
Pine Oil	74.0 lb.
Zinc Oxide	212.0 lb.
Silica	82.0 lb.
Asbestine	83.0 lb.

Cuprous Oxide	112.0 lb.
Mercuric Oxide	45.0 lb.

Although commercially made phenol-formaldehyde condensates have not proved satisfactory in undersea water exposure, there apparently is considerable merit to a varnish from such resin when the resin is made simultaneously with the varnish. These varnishes comprise the vehicle of the ship bottom paints and are made in reflux condensers. Typical of the process is the following:

Place 90 lb. of phenol, 108 lb. of 40% solution of formaldehyde, 90 lb. of water and 54 lb. of lead acetate in a reflux condenser and boil about 30 minutes. Add 720 lb. of rosin and continue heat until excessive foaming starts. Remove the reflux and continue heat until foaming ceases and at same time blow air through the mixture. Cool and add 108 gal. of coal tar naphtha.

The varnish is mixed with pigments to form anti-corrosive and anti-fouling paints.

Anti-Corrosion and -Fouling Paint

Yacca Gum	1.6 lb.
Alcohol	1.32 gal.
Pine Oil	1.9 gills
Petroleum Spirits	1.9 gills
Zinc Oxide	1.2 lb.
Silica	1.2 lb.
Blanc Fixe	1.2 lb.
Zinc Dust	0.3 lb.
Paris Green	0.6 lb.
Mercuric Oxide	1.4 lb.

Paints for Ship Bottoms

Formula No. 1

2.5 parts of wood tar, 2.0 parts of oxide of iron, 1.0 part of turpentine resin, 2.0 parts of lead acetate. Wood tar is preferable to coal tar, since the latter is not as resistant towards the corrosive action of sea water.

No. 2

1.0 parts of lead arsenate, 1.0 parts of Scheele's green (copper arsenite), 8.0 parts of ochre, 5.0 parts of turpentine resin, 3.0 parts of coal tar, 2.0 parts of Bakelite, 5.0 parts of oil of turpentine and 5.0 parts of white spirit.

No. 3

The so-called "Lucchini Paint": 30.0 parts of galipot (white resin produced from fir), 20.0 parts of turpentine resin, 2.5 parts of mercury arsenate, 20.0 parts of red arsenic, 30.0 parts of wood tar, 5.0 parts of manganese dioxide and 15.0 parts of oil of turpentine.

No. 4

600.0 parts of asphaltum or pitch, 480.0 parts boiled linseed oil, 120.0 parts of graphite, 120.0 parts of arsenic-copper oxide and 640.0 parts of coal tar oil.

No. 5

48.0 parts of coal tar, 383.0 parts of tar oil, 146.0 parts of turpentine resin, 130.0 parts of manganese linoleate, 3.5 parts of beeswax, 93.0 parts of Venetian red, 93.0 parts of infusorial earth and 187 parts of zinc oxide.

No. 6

133 parts of coal tar, 288 parts of tar oil spirits, 20 parts of turpentine resin, 74 parts linseed oil, 21 parts of zinc oxide, 82 parts of infusorial earth, 83 parts of magnesium silicate, 112 parts oxide of copper and 145 parts mercury oxide.

Ship Bottom Paints

An anti-corrosive paint is prepared from 145 parts of oiticica fatty acids, 120 parts shellac, 390 parts alcohol, 80 parts pine oil, 5 parts drier, 170 parts of iron oxide, and 160 parts of zinc oxide.

The anti-fouling composition given is, 145 parts of oiticica fatty acids, 129 parts shellac, 430 parts alcohol, 80 parts pine oil, 5 parts drier, 170 parts of iron oxide, 160 parts of zinc oxide, and 100 parts red oxide of copper, and 40 parts of yellow oxide of mercury.

To prepare these paints the shellac is dissolved in some of the alcohol, the pine oil added, and then the pigments ground in, using a ball mill. When perfectly smooth, the fatty acids, mixed with the pine oil and the remainder of the alcohol, are added. The same method is used in the case of the anti-fouling composition except that the yellow oxide of mercury is not ground in but only mixed.

After storage these products appear very thick, but spread easily under the brush to give a thick flexible film. A little diluent can be added if necessary.

The cobalt, lead and manganese salts of the fatty acids of oiticica oil, which are in the nature of driers, are prepared by converting the acids into soluble soaps and precipitating these by the acetate of the appropriate metal. The precipitate is carefully washed and dried in a carefully regulated oven in a current of carbon dioxide to prevent oxidation.

Paints for Glazing and Coloring Ceramics

Pigments (glass-powder, colored with metal oxides)

Thinner:

Linseed Oil	5 lb.
Wood Oil	3 lb.

Artificial Mother-of-Pearl

British Patent 426,554

Dibasic lead phosphate ($PbHPO_4$) prepared by adding phosphoric acid to a warm solution of a lead salt, if used in the form of very fine crystals, produces glistening or iridescent effects. The salt may be obtained in a very fine state of division by precipitation in presence of a water-soluble organic compound, and preferably under slightly acid conditions. Thus 24 liters of a solution of lead nitrate (3.3 kg. dissolved in 10 liters of water) are mixed with 4.8 liters of distilled water and 24 liters of 95 per cent alcohol; 2.6 liters of phosphoric acid (12 kg. of concentrated acid plus 50 liters of 90 per cent alcohol) are added all at once. The use of this lead phosphate in materials which are to be submitted to treatment with formaldehyde (e.g., casein products) is advantageous in that the salt is not affected by formaldehyde.

Enamel Opacifier

British Patent 427,850

A fine white powder is obtained by heating at 1000° for several hours an intimate mixture of titanium dioxide 33.1, antimony pentoxide 44.5, and zinc oxide 22.4%.

Pearl or Fish Scale Essence

German Patent 603,487

Formula No. 1

a. Scales of Uklei Fish (Pomerania)	100 kg.
b. { *n*-Propyl Acetate	150 l.
{ Nitrocellulose	1.5 kg.

Treat *a* with *b* in a stirring-machine for 30 minutes, pour off the upper suspension, and repeat the same treatment of *a* two more times. Now the scales are free of fish-silver, the suspension containing about 1500-2500 g. of this substance.

No. 2

a. Herring Scales, Norwegian	100 kg.
b. { Ethyl Propionate	150 l.
{ Nitrocellulose	1.5 kg.

As in No. 1. Yields in fish-silver are quantitative, viz. 700-1000 g. crude material.

No. 3

a. Astrachan Scales	100 kg.
b. { Ethyl Acetate	150 l.
{ Nitrocellulose	3 kg.

Work as in No. 1, stirring two times for 20 minutes. 1200-1600 g. crude fish-silver can be obtained by centrifugal separation of the suspension.

No. 4

a. Uklei Scales (from Lake Scutari, Albania)	1 kg.
b. Ethyl Acetate	1.5 l.
c. { Acetyl Cellulose	25 g.
{ Alcohol, a little to dissolve completely.	

As in No. 1 in smaller proportions. Should yield 1.4 liter suspension with 0.4% dry fish-silver.

Protective Coating for Hydrofluoric Acid Containers

Beeswax	1 oz.
Paraffin Wax	4 oz.

Electric Lamp Coating

U. S. Patent 1,941,990

The lamps are coated with a paste of

Kaolin	50 g.
Guignet's Green	200 g.
Cadmium Sulphide	50 g.
Boric Acid	160 g.
Sodium Silicate (d. 1.015)	1000 cc.

Coating Lacquer for Fabrics

Nitrocellulose Wet (5.6 sec.)	12 g.
Diamond "K" Linseed Oil	8 g.
Crude Crepe Rubber (Light)	8 g.
Ethyl Acetate	10 g.
Butyl Acetate	10 g.
Alcohol	5 g.
Toluol	47 g.

Heat crude rubber in linseed oil until dissolved. Cool and dilute with part of toluol. Add to remainder of formula after nitrocellulose is dissolved.

Rubberized Cloth Varnish

Formula No. 1

Shellac	5 oz.
Alcohol	95 oz.

Gives high gloss.

No. 2

Shellac	1 kg.
Ammonia (28%)	½ kg.
Water	30 kg.

Two coats of this must be applied to get good adhesion. The finish is semi-glossy. These varnishes are applied by a velvet covered brush or roller.

Waterproofing Brick Walls

Walls can be waterproofed by applying a coat of solution made by dissolving 1¾ lb. of paraffin in each gal. of mineral spirits used as a solvent. Use steam to melt rather than a free flame.

Moistureproofing Compositions
Canadian Patent 352,183

Moistureproofing compositions consist of (parts by weight): Formula No. 1, paraffin 85, refined carnauba wax 10, rubber 5; (No. 2) paraffin 65, rubber 5, candelilla wax 30; (No. 3) paraffin 75, rubber 5, gum damar 20; (No. 4) paraffin 40, rubber 5, carnauba wax 40, ester gum 15; (No. 5) paraffin 60, rubber 5, carnauba wax 20, gum damar 15; and (No. 6) paraffin 55, rubber 4, candelilla wax 25, hydrogenated castor oil 16 parts.

Jute Waterproofing
French Patent 763,402

Asphalt	60 lb.
Bitumen	10 lb.
Coal Tar	5 lb.
Coal Tar Pitch	5 lb.
Linseed Oil, Boiled	2 lb.
Sand, Fine	15 lb.
Bordeaux Resin	3 lb.

Straw Lacquer Waterproofing
Italian Patent 267,765

Cellulose Nitrate	10 oz.
Butyl Acetate	20 oz.
Benzol	48 oz.
Butyl Alcohol	7 oz.
Paraffin Wax	2 oz.
Camphor Oil	8 oz.
Butyl Ether	5 oz.

Waterproofing Compound and Paint Vehicle
U. S. Patent 1,965,042

Three gallons of china-wood oil is raised to a temperature of about 240° C.; at this temperature 12 grams of manganese borate is added with rapid stirring. The temperature is maintained for a period not exceeding about fifteen minutes, but preferably from one to two minutes. In order to quickly cool the oil and also to partially dilute it, about 1 gallon of water white kerosene is added. The temperature of the mass will thus be reduced to about 175° C. and when this temperature is attained 1½ pints of carbon tetrachloride is gradually added by introducing the same preferably near the bottom of the vessel. The rate of introduction of carbon tetrachloride is such that from 1–2 minutes are required for this step of the process. When the carbon tetrachloride has been introduced and the temperature has been reduced sufficiently, for example, to about 100° C., any desired quantity of diluent such as kerosene or solvent naphtha is added.

This forms a solution of waterproofing material which when applied to stone, brick, masonry and the like penetrates the pores of the same and coats the surface of the material to which it is applied, efficiently protecting it from the elements such as rain, sea water, salt water air, heat and frost. The coating is not substantially acted upon by alkalies or acids and forms a colorless waterproofing material which remains effective for many years.

Waterproofing Composition
Belgian Patent 400,446

The composition contains carbon tetrachloride or carbon disulphide 200 cc., paraffin 150 g., rubber 8 g., and naphthalene 50 g. per liter.

Waterproofing Composition
U. S. Patent Serial Number 513,225

A waterproofing composition which comprises forming a mixture of from 285 to 290 parts of water, 12 to 16 parts of sodium silicate and 9 to 10 parts of oleic acid and then stirring into this mixture approximately 300 parts of comminuted cumar resin (melting point about 230° to 245° F.) while maintaining the liquid at a temperature above 90° F. and not to exceed substantially 160° F.

Moisture and Greaseproof Coating
Formula No. 1

Gelatin	5.4 oz.
Sulfonated Oil	2.7 oz.
37% Formaldehyde Solution	1.4 oz.
Glycerin Monophthalate Ester	4.5 oz.

No. 2

In another specific formula, to each 100 oz. of a vehicle containing 10% alcohol add the following:

Gelatin	7.2 oz.
Glycerin	3.6 oz.

37% Formaldehyde Solution	1.8 oz.
Glycerin Monophthalate Ester	3.6 oz.

No. 3

In a third specific example add to each 100 oz. of vehicle:

Gelatin	5.8 oz.
37% Formaldehyde Solution	1.4 oz.
Glycerin Monophthalate Ester	5.8 oz.

The two latter formulas, however, do not have the full effectiveness of the first in producing moisture-resistant and greaseproof coatings.

In preparing the composition, when alcohol is employed in the vehicle, it is kept separate from the remaining constituents of the mixture until a late stage in the formation thereof. The gelatin is dissolved in a portion of the water, and, if desired, may be mildly acidulated, for example, with acetic acid. The flexibility-imparting agent, if any is used, is added to the aqueous solution of gelatin, suitably after admixture with or solution in a small amount of water, although this is not necessary. The formaldehyde solution is diluted with water. The diluted formaldehyde solution is then added, or, in its place, suitable proportions of a solution of hexamethylenetetramine, or alum or the like may be employed. The alcohol is diluted, suitably with an equal amount of water, and then added to the mixture. The glycerin phthalate ester or other ester employed is then dissolved in part or all of the remaining quantity of water, neutralized, for example, with ammonium hydroxide, and incorporated in the mixture.

Waterproof Finish

	Formula No. 1	No. 2
Tornesit	20 g.	20 g.
Methyl Abietate	12 g.	16 g.
Cumar V	12 g.	24 g.
Indian Red	25 g.	—
Titanium Dioxide	—	40 g.

Waterproofing Fibrous Materials
U. S. Patent 1,965,630

One thousand pounds of pulp fiber dry weight is mixed in an ordinary paper mill beater with about 20,000 pounds of water. To this is added about 300 pounds of alkaline filler such as calcium carbonate, 15 pounds of ammonium resinate (dry weight) is then added in the form of an aqueous solution containing 500 pounds of water. 15 pounds of alum are then added, which immediately reacts with the carbonate to form theoretically 3½ pounds of precipitated alumina. Instead of adding this alum to the beater, the alum solution may first be neutralized with ammonia or other alkali, and the precipitated alumina added to the beater with the size. The hydrated aluminum oxide will combine in the beater with the ammonium resinate to form a compound which coats the fibers in the beater and which will size the paper when the pulp is dried.

Another method of operation is as follows:

The carbonate filler, or other filling material, is mixed with water in a tank to a concentration of about 20% solids to which mixture is added an aqueous solution containing ammonium resinate to the extent of about 1 pound of the dry resinate to 100 pounds of filler. To this may be added 1 pound of alum to each 100 pounds of filler along with sufficient ammonia or other alkali to neutralize it and precipitate the alumina.

This separately treated filling material containing sizing ingredients may be added to the paper stock in the beater, in the Jordan chest, in the machine chest, or at the wet end of the paper machine. This treatment produces a paper containing individually sized filler particles, that is, each particle thereof is coated individually with size. The paper stock in the beater may be sized by the use of ammonium resinate and alumina. If this is done, the result is a paper with fibers and filler particles individually sized with the same sizing materials. Or the paper stock may be first sized with any sodium resinate and sufficient alum to acidify the fibers, whereupon and later, the ammonia sized filler material is added thereto in the beater, machine chest, Jordan, and so forth, whereby a paper is produced having its fibers individually sized by the use of sodium resinate while its filler particles are individually sized with ammonium resinate and alumina. Since the ammonium resinate is somewhat more expensive than sodium resinate, this latter procedure offers some saving in cost over treating both fibers and filler with ammonium resinate.

In general, in the final mixture of paper fibers and filling material, there must be no alkalinity derived from soda. There will be none in the mixture resulting from the practice of this invention because any alkalinity produced by the ammonium resinate disappears on drying of the paper. This produces a neutral and sized paper.

With the present processes using sodium resinate, it is not possible to fully size a heavily loaded paper containing from 20% to 30% filler even if the filler is not alkaline. By the use of this process, however, any kind of filling material can be sized. In order that ammonium resinate may properly function as a sizing material there should always be present enough excess ammonia or other alkali, to form sufficient alumina when reacting with alum to form a resinate of alumina, but it is immaterial how this ammonium hydrate is produced.

Waterproofing Composition
U. S. Patent 2,022,405

Refined Paraffin Wax	4 lb.
Paracoumarone Resin	2 lb.
White Beeswax	1 lb.
Aluminum Palmitate	4 lb.

The above ingredients being blended together and dissolved in a composite solvent of xylol and carbon tetrachloride in the proportions of about three parts by volume of xylol to one part by volume of carbon tetrachloride, and the amount of solvent being such that about 2¾ ounces of the above composition is contained in each gallon of solution.

Fireproofing Materials
French Patent 774,089

An antiseptic fireproofing composition for wood, paper, etc., contains, e.g., ammonium orthophosphate 5 grams, sodium tetraborate 2.5 grams, and ammonium chloride 2.5 grams.

Exterior Primer

Pigment	67 lb.
Vehicle	33 lb.
Pigment:	
Titanox B	37.1 lb.
White Lead (Carbonate)	37.1 lb.
Asbestine	24.8 lb.
Litharge	1.0 lb.
Vehicle:	
Archer-Daniels No. 635	64 lb.
Mineral Spirits	26 lb.
*VM-1367	8 lb.
2% Liquid Cobalt Drier	2 lb.

* VM-1367: Heat 15 gal. china-wood oil with 75 lb. low acid ester gum to 565° F. Remove from fire and let rise to 585° F., hold for 5 minutes and check with 25 lb. ester gum. Thin at 400° F. with 15 gal. mineral spirits.

Painting Primer
German Patent 608,738

Zinc Oxide	30 g.
Ochre	30 g.
Linseed Stand Oil	14 g.
Linseed Oil Varnish	21 g.

The above is thinned with:

Linseed Oil Varnish	3 g.
Benzine	9 g.

Exterior Wood Primer

Pigment	66 lb.
Vehicle	34 lb.
Pigment:	
Titanium-Barium Pigment	34 lb.
White Lead (Carbonate)	26 lb.
Metronite	40 lb.
Vehicle:	
Bodied Linseed Oil	13 lb.
Blown Linseed Oil	5 lb.
Raw Linseed Oil	27 lb.
20-gal Ester Gumwood Oil Varnish	20 lb.
Mineral Spirits	32 lb.
Drier	3 lb.

Priming Paint from Hardened Paint
German Patent 607,554

Dissolve old paint in following:

Butyl Alcohol	50 lb.
Xylol	10 lb.
Benzol	10 lb.
Toluol	10 lb.
Ethyl Acetate	5 lb.
Ether	5 lb.

Galvanized Roof Primer

Dry Red Lead	10 lb.
Boiled Linseed Oil	9½ gal.
Turpentine	1⅞ gal.
Drier	⅛ gal.

Galvanized Roof Finish

Dry Red Lead	5 lb.
*Carbon Black Paste	31 lb.
Boiled Linseed Oil	6¼ gal.
Turpentine	1⅞ gal.
Drier	⅛ gal.

* The carbon black paste referred to in this formula is 18.0% carbon black and 82% boiled oil.

Paste Paint L, White Lead

Basic Carbonate White Lead	28.4 lb.
Raw Linseed Oil	3.88 lb.

Paste Paint TLZ, Titanox-Lead-Zinc

Titanox B	9.8	lb.
Basic Carbonate White Lead	7.6	lb.
Zinc Oxide, Lead-Free	4.33	lb.
Raw Linseed Oil	3.88	lb.

Spot Priming Paint

Paste Paint TLZ (above)	1	gal.
Raw Linseed Oil	1	gal.
Turpentine	0.28	gal.
Drier	0.05	gal.

Under Coat Paint

Paste Paint L or TLZ (above)	1	gal.
Raw Linseed Oil	0.51	gal.
Turpentine	0.62	gal.
Drier	0.04	gal.

Finish Coat Paint

Paste Paint L or TLZ (above)	1	gal.
Raw Linseed Oil	1	gal.
Turpentine	0.12	gal.
Paint Drier	0.06	gal.

Tropical Roofing Paint

Paste White Lead	100	lb.
Non-setting Red Lead	10	lb.
Lamp Black in Oil	½	lb.
Raw Linseed Oil	3	gal.
Boiled Linseed Oil	1	gal.
Turpentine or White Spirit	½	gal.
Terabine Driers	1	pt.

A proportion of hard drying outside quality varnish may be added if desired. Thin out this paint to the desired consistency with equal parts of raw linseed oil and turpentine. Where the paint must be cheapened, barytes, china clay, slate powder, or ochre is incorporated as an extender.

Priming Structural Paint

Formula No. 1

Dry Basic Lead Chromate	15½	lb.
Raw Linseed Oil	5	pt.
Turpentine	2	gills
Liquid Drier	2	gills

No. 2

Dry Basic Lead Chromate	15½	lb.
Boiled Linseed Oil	5	pt.
Turpentine	1	pt.

These paints weigh about 21 pounds per gallon and the non-volatile portion contains about 30% by volume of pigment.

White Exterior Bakelite Enamel (Yacht White)

Pigment	40	lb.
Vehicle	60	lb.

Pigment:

Basic Carbonate White Lead	40	lb.
Titanium-Barium Pigment	40	lb.
Titanium Oxide	20	lb.

Vehicle:

*Varnish XV-4430	60	lb.
†Varnish XV-5922	20	lb.
Mineral Spirits	20	lb.

Drier:

Lead per gallon enamel, as naphthenate	2.5	g.
Cobalt	0.15	g.
Manganese	0.05	g.

*Varnish XV-4430:

Bakelite Resin XR-2963	100	lb.
China Wood Oil	20	gal.
Body Q Linseed Oil	30	gal.
Lead Acetate	2	lb.
Mineral Spirits	34	gal.
Dipentene	5.5	gal.

Procedure:

Place the Bakelite, the China wood oil and 10 gallons of the linseed oil in the kettle. Heat to 560° F. in one hour. Add the remaining 20 gallons of linseed oil. The temperature will drop to about 450° F. Reheat to 520° F. Add the lead acetate. Cool quickly with the aid of water spray to 450° F., and thin with the mineral spirits.

†Varnish XV-5922:

Bakelite Resin XR-2963	100	lb.
China Wood Oil	7.5	gal.
Body Q Linseed Oil	2.5	gal.
Lead Acetate	2.5	lb.
Lead Carbonate	1.25	lb.
Mineral Spirits	15	gal.

Procedure:

In 50 minutes heat the Bakelite and China wood oil to 450° F. In an additional 18 minutes raise the temperature to 540° F. Add the linseed oil and the driers. Let the temperature drop to 450° in about 20 minutes, and thin with the mineral spirits.

Lead Titanate Exterior Paints

Formula No. 1

Lead Titanate	1000	lb.
Raw Linseed Oil	252	lb.
China Wood Stand Oil	28	lb.
Lead-Manganese-Cobalt Drier	8	lb.
Mineral Spirits	42	lb.

No. 2

Lead Titanate	400	lb.
Basic Carbonate White Lead	400	lb.
Asbestine	100	lb.
Silica	100	lb.
Raw Linseed Oil	382	lb.

China Wood Stand Oil	52	lb.
Cobalt Naphthenate	10.8	lb.
Mineral Spirits	65.9	lb.

No. 3

Lead Titanate	400	lb.
Basic Carbonate White Lead	400	lb.
Zinc Oxide	200	lb.
Raw Linseed Oil	324	lb.
Kettle Bodied Linseed Oil (Viscosity Z)	21.6	lb.
Lead-Manganese-Cobalt Drier	20.4	lb.
Mineral Spirits	40.7	lb.

No. 4

Lead Titanate	400	lb.
Titanox-B	400	lb.
Zinc Oxide	200	lb.
Raw Linseed Oil	400	lb.
Kettle Bodied Linseed Oil (Viscosity Z)	26.4	lb.
Lead-Manganese-Cobalt Drier	25.1	lb.
Mineral Spirits	50.1	lb.

No. 5

Lead Titanate	200	lb.
Titanox-B	200	lb.
Basic Carbonate White Lead	200	lb.
Zinc Oxide	200	lb.
Asbestine	100	lb.
Silica	100	lb.
Raw Linseed Oil	466	lb.
Kettle Bodied Linseed Oil (Viscosity Z)	29.6	lb.
Lead-Manganese-Cobalt Drier	29.2	lb.
Mineral Spirits	58.4	lb.

*This type is of special interest for use as a base for house paint tints.

Fire Retarding Interior Whitewash

1. Mix about 120 lb. of spent carbide residue with water to a creamy consistency.
2. Mix 2½ lb. of rye flour thoroughly with ½ gal. of cold water, and then thin with 2 gal. of boiling water.
3. Dissolve 2½ lb. of common salt in 2½ gal. of hot water.
   Mix (2) and (3), then add (1), and stir until well mixed.

Exterior Weatherproof Whitewash

Formula No. 1

1. Mix about 120 lb. of spent carbide residue with water to a creamy consistency.
2. Dissolve 2 lb. of common salt and 1 lb. of zinc sulphate in 2 gal. of boiling water.
3. Provide 2 gal. of skimmed milk.
   Pour (2) into (1), then add (3), and stir well.

No. 2

1. Mix about 15 lb. of spent carbide residue to a creamy consistency with water.
2. Dissolve 1 lb. of carbonate of soda in ¼ gal. of boiling water.
3. Soak in cold water for at least 8 hr. ¼ lb. of common glue and 1 lb. of rice flour; and then thoroughly dissolve the glue mixture in ¾ gal. more water in a double boiler. Mix (1) with (2), then add (3).

No. 3

1. Mix about 12 lb. of carbide residue to a creamy consistency with water.
2. Dissolve 4 oz. of white rosin in 12 fluid oz. of boiled linseed oil.
3. Beat 6 lb. of whiting in 1 gal. of skimmed milk.
   Mix (2) with (1) while hot, add (3).

Hints for Special Uses

Alum added to whitewash prevents its rubbing off. Flour paste will also prevent rubbing off, but when this is used, zinc sulphate must be added as a preservative.

Molasses causes lime to penetrate wood and plaster better. One pint of molasses to 5 gallons of whitewash is generally considered sufficient. A solution of silicate of soda or water glass, one part to ten parts of whitewash, makes what is commonly referred to as a "fireproof cement" of whitewash.

By adding 1 pound of cheap bar soap dissolved in 1 gallon of boiling water, to every 5 gallons of whitewash, a more or less gloss finish can be obtained.

A *fire retardant whitewash*, of a type used extensively by the U. S. Lighthouse Board, is made according to this formula:

1. Mix about 60 lb. of spent carbide residue with water to a creamy consistency.
2. Dissolve 1 peck of salt in warm water.
3. Add (2) to (1) and mix.
4. Boil 3 lb. of ground rice in water to to a thin paste.
5. Dissolve 1 lb. clear glue in hot water.
6. Provide ½ lb. of powdered Spanish whiting.
7. Mix (4), (5), and (6) together and add to mixture (3). Mix well and let stand for several days.

Keep the wash thus prepared in a kettle or portable furnace, and when used put it on as hot as possible with a painter's brush or whitewash brush.

Cold Glaze for Wall Tiles

Lacquer Base

a.	Shellac	8 oz.
	Turpentine, Thick	5 oz.
	Alcohol	35 oz.
b.	Sandarac	14 oz.
	Turpentine, Thick	6 oz.
	Alcohol	35 oz.

Mix 10 oz. of *a* with 12 oz. of *b*

To this lacquer base add finely powdered pigments, as to color

Lamp Black	(Black)
Ultramarine or Paris Blue	(Blue)
Chrome Yellow, Zinc Yellow or Ochre	(Yellow)
Chrome Green	(Green)
Chrome Red or Cinnabar	(Red)
Lithopone	(White)

(Grind Pigment with a small part of the lacquer solution; thin later with the rest to needed consistency.)

Floor Finish

(Permanent, Scratch-free) Clear (Natural) Finish:

Formula No. 1

Castor Oil	1 qt.
Boiled Linseed Oil	½ gal.
Paraffin Wax	3¼ lb.
High-Flash Naphtha	3 qt.
Gasoline	1½ gal.
Varnolene	1 gal.

Mix the oils and wax and heat until the wax is molten. Add the varnolene, naphtha and gasoline slowly in the order mentioned.

No. 2

Dark Finish

Castor Oil	1 qt.
*Gilsonite Cook	1 gal.
Paraffin Wax	3 lb.
High-Flash Naphtha	1 qt.
Gasoline	1½ gal.
Varnolene	1 gal.

Heat oil and wax until molten, add the gilsonite cook and proceed as above.

*Gilsonite Cook:

Gilsonite	5 lb.
Kellogg Varnish Oil	1½ gal.
High Flash Naphtha	1¼ gal.

Heat gilsonite and oil to 270° C. (520° F.). Let cool and thin with naphtha.

Any shade may be obtained by intermixing clear and dark finish. Apply by flowing on the freshly scraped floors, distribute and rub in lightly with rags. Permit to dry for at least 48 hours. This finish actually impregnates the floor and will not wear off. It has a velvet sheen and a slight slip, is easy to keep clean and is very resistant to moisture.

Varnish for Naval Aircraft

Materials:

Bakelite BR-254	50	lb.
Bakelite XR-4036	50	lb.
Castor Oil (Refined)	4.33	lb.
China Wood Oil	33	gal.
Mineral Spirits	27	gal.
Xylol	4	gal.
Dipentene	4	gal.
Lead-Cobalt-Manganese Naphthenate Driers		

Procedure:

Heat the oil and the Bakelite resins together to 310° F. in 25 minutes, and hold at that temperature for half an hour. Heat to 450° F. in 20 minutes and hold for 20 minutes. Remove from the fire, add the thinners, the castor oil and sufficient drier to give 12 grams cobalt, 15 grams manganese and 160 grams lead as metal.

Airplane Varnish

The naval aircraft factory has developed a formula for satisfactory bituminous varnish which is used for airplane hulls or other parts exposed to salt water or salt spray. This formula is as follows:

Aluminum Powder	2 lb.
Bituminous Primer	1 gal.

Coating for Aluminum or Brass

Nitrocellulose	5 g.
Amyl Acetate	55 cc.
Alcohol	40 cc.

Aluminum Powder Paste

U. S. Patent 2,002,891

Aluminum, Flaked	58 oz.
Stearic Acid, Powdered	1 oz.
Aluminum Stearate	1 oz.
Naphtha	40 oz.

Grind together until homogeneous.

Preparing Aluminum for Enamel

The best method of cleaning aluminum castings, so the finish will adhere tenaciously, is to use the sandblast. Smooth

aluminum surfaces are of such character that an ordinary first coat of finishing material will not adhere to them satisfactorily, even when they are clean. The sandblast will leave the surface slightly etched and will aid the first coat in sticking to the metal permanently.

If sandblasting is impractical, about all that can be done is to thoroughly wash the castings with naphtha or some other solvent for grease, and dry them thoroughly with clean cloths.

In other instances it may be satisfactory to bake the castings for a short time at 400 or 500° F., just before finishing them, to burn off any oil or grease. It is not advisable to use caustic cleaning solutions with aluminum, because the metal is so easily attacked and dissolved by this chemical.

Another method is as follows: Immerse them in a 20% solution of acetic acid until all oil and grease is removed or neutralized. Then rinse in a vat of clear hot water and allow castings to drain and dry. Do not wipe them. Spray or brush as soon as the moisture has disappeared.

Bronzing Liquid

Celluloid Scrap	3 oz.
Amyl Acetate	12 oz.
Benzine	28 oz.
Denatured Alcohol	24 oz.

This solution is mixed with sufficient dry gold bronze to make a smooth working paint and the resulting paint must be used at once as it is apt to turn greenish and thicken to a jelly on standing.

Bronze Painting Tinctures

A. *a.*	Water	90 oz.
	Alcohol	10 oz.
b.	Isinglass or Mirror Gelatin	as desired

Add to this colloidal solution with stirring:

c. Bronze Powder sufficient to suit.

B. for *a* and *b* take:

Potash-Water Glass	10 oz.
Gum Arabic	10 oz.
Water	40 oz.

C. or Thick Gum Arabic Solution with a little ox-gall.

Paints for Copper

Copper, bronze, or brass gutters and flashings, as well as copper or bronze screening, are apt to cause bad yellowish-green stains on light- or white-painted houses, owing to the washing off of corrosion products. Exposure tests indicate that one of the best ways to paint copper or bronze surfaces is to wash off any grease, using gasoline or turpentine. The surface should be roughened slightly with sandpaper, and a priming coat composed of 1½ to 2 pounds of aluminum powder to 1 gallon of aluminum mixing varnish applied, followed by the desired color coat. Weathered copper or bronze screening should be thoroughly dusted, and then given two coats of a thin black paint. Some of the best grades of black auto top dressings, which are free from asphalt, but are essentially thin, water-resistant, carbon black enamels, make excellent screen enamel.

Cable Lacquer
British Patent 397,554

Cellulose Acetate	12 oz.
Triacetin	12 oz.
Mineral Oil (b.p. 330–390° C.)	0.8 oz.
Acetone	50.2 oz.
Toluol	10 oz.
Alcohol	10 oz.
Diacetone Alcohol	5 oz.

Electrolytic Condenser Coating
British Patent 419,927

Acetone	137.8 cc.
Amyl Acetate	125.0 cc.
Phenol-Formaldehyde Resin	39.9 g.
Graphite (99%)	42.5 g.

This is baked on aluminum for 24 hours at 100° C. and 2 hours at 170° C.

Electrical Wire Lacquer
British Patent 410,576

Cellulose Acetate	100 oz.
Tetrachlorethane	100 oz.
Alcohol	20 oz.
Triacetin	3 oz.

Adhesiveness may be increased by incorporating talc and opacity by zinc oxide.

Wash for Galvanized Iron before Painting

a.	Denatured Alcohol	60 fl. oz.
	Toluol	30 fl. oz.
	Carbon Tetrachloride	5 fl. oz.
	Commercial Concentrated Hydrochloric Acid	5 fl. oz.
b.	Copper Acetate	6 oz.
	Water	1 gal.

c.	Copper Nitrate Crystals	2 oz.
	Copper Chloride Crystals	2 oz.
	Ammonium Chloride Crystals	2 oz.
	Commercial Concentrated Hydrochloric Acid	1/6 pt.
	Water	1 gal.

Solution *a* will cut grease as well as etch. If the metal is not free from grease, solutions *b* and *c* must be preceded by a grease-removing operation.

Treatment of Galvanized Sheets for Painting

A simple and inexpensive way to treat new galvanized sheets before painting is to use ordinary vinegar, either sponged or brushed on. Vinegar rather thoroughly removes the slick film usually found on newly galvanized sheets. It does not, however, etch the surface like some other treatments. After the vinegar has been applied and allowed to remain on the sheets for five minutes or so, it should be wiped and then the surface of the sheet allowed to completely dry before paint is applied.

Another somewhat similar treatment is the use of two or three per cent acetic acid solution at a temperature of about 130° F. If it is possible to dip the sheets, or articles made from the sheets, in this solution, allow them to remain there for about ten or fifteen minutes. After removal, they should be thoroughly rinsed and allowed to thoroughly dry.

Still another, even more practical, although perhaps a little more costly, method of obtaining a clean and etched surface is to apply, with an oil-free brush, and allow to remain for about ten minutes, an acidified solution made up as follows:

Denatured Alcohol	50 fl. oz.
Toluol	35 fl. oz.
Hydrochloric Acid	5 fl. oz.

This solution should be prepared only as required for immediate use. After the reaction is complete and the surface is thoroughly dried, wash or rinse with clean water to remove any soluble salts that may have formed. Then, allow the sheets to thoroughly dry again before applying paint. This treatment is especially effective if the procedure outlined above is carefully followed.

It should be particularly noted that with each of the three methods outlined, it is important that the galvanized surface should be thoroughly dry before painting. A film of moisture between the paint and sheet would cause very poor adherence.

Painting Galvanized Iron

Excellent paint adherence on galvanized surfaces may be obtained by cleaning with the following solution:

Alcohol	65 lb.
Toluol	35 lb.
Muriatic Acid (Commercial Concentrated)	5 lb.
Carbon Tetrachloride	10 lb.

This treatment should be followed by a cold rinse after the material has dried.

Lacquer for Hot Water Containers

Lacquer Linseed Oil	250 g.
Milori Blue	15 g.
Gilsonite	120 g.
Albertol Resin (116° m.-p.)	40 g.
Thick Linseed Oil	40 g.
Manganese Hydroxide	2.5 g.
Cobalt Drier	1.25 g.
Toluol	500 g.

Iron "Lacquer"

Gilsonite Asphalt	20 kg.
Manila Copal	5 kg.
Lampblack	3 kg.
Toluol	50 kg.

Iron Protective Paint

Formula No. 1

Lampblack (Ground in Oil)	90.7 oz.
*Asphalt Varnish	68.1 oz.
Linseed Oil, Raw	68.1 oz.
Japan Drier	2.0 oz.

No. 2

Lampblack	27 oz.
Silica	58 oz.
Red Lead	10 oz.
Graphite	5 oz.
*Asphalt Varnish	Sufficient

Grind together until smooth.

*Turpentine	1 part
Asphalt in Linseed Oil	1 part

Primers for Light Metal Alloys

Owing to high coefficient of expansion and contraction with temperature changes, a primer is needed that will be sufficiently flexible not to be ruptured by expansion and contraction. A zinc chromate paint is recommended for this purpose, a specimen formula being:

Zinc Chromate	40 lb.
Neutral Red Oxide of Lead	80 lb.
Boiled Linseed Oil	60 lb.
Pure Turpentine	16 lb.
Strong Japan Driers	4 lb.

Another priming paint found to be satisfactory is made from:

Dry Lampblack	65 lb.
Linseed Oil	15 lb.
Pure Turpentine	10 lb.

Driers according to type and quality.

The primer should be allowed 50 to 60 hours to dry and harden before applying subsequent coatings.

Polished Metal Lacquer

Nitrocellulose Wet (15-20 sec.)	10 g.
Rezyl No. 468-2 (50% Solution)	10 g.
Dibutyl Phthalate	2 g.
Butyl Acetate	10 g.
Butyl Alcohol	8 g.
Butyl "Cellosolve"	10 g.
Toluol	35 g.
Xylol	15 g.

Preparing Magnesium Alloys for Painting

To prepare the surface of magnesium alloys so that paint will adhere, it is recommended that the alloy be first immersed in the following:

Sodium Dichromate	1.5 lb.
Concentrated Nitric Acid	1.5 pt.
Water	1 gal.

In a new solution, only 15 seconds are needed. This time increases to two minutes for an old solution.

After rinsing and drying, the proper primer should be used, containing inert pigments or, for example, zinc chromate. For interior work, a minimum of two coats (total) paint should be used; for exterior work, a minimum of four coats.

Care and Preservation of Bronze Statues

Statues, tablets, medals, especially those standing in the open, require careful treatment and protection from the conditions tending to their corrosion. Of cleansing reagents, water only is permissible with, perhaps, a small quantity of soap extract. Bronze which has become black by long exposure may be restored to its original gold color by washing with water to which a little ammonia is added, using a brush with bristles, no wire brush.

As protective coating, a mixture of beeswax and turpentine is considered the best, it affords considerable protection to bronze from atmospheric attack and gives a pleasing appearance, besides drying rapidly. Applied three times a year it will safeguard a statue to a high degree from corrosion and deterioration even in an exposed position. A mixture of lanolin and paraffin is not quite as good as it does not dry as rapidly and is therefore liable to collect dust.

Heatproof Rust Protective Coatings

Kerosene and pitch cannot be used as binders as they become too soft even at 150-200° C. Natural asphalts, although brittle, give protection up to 250° C., acetyl cellulose up to 100° C. Only lean, not fatty binding agents rich in resins, should be used for such paints. As at 400° C. almost all binding agents are entirely disintegrated, the residues of the agents must be such that they leave a continuous, well adhering coat on the metal to be protected. Durophen, aluminum bronze, zinc dust with binders of this type give good results. Heatproof paints should never be sprayed on, as they have the tendency to spall off later, but brushed on, except zinc dust which may also be sprayed.

Rust Proofing

A good protective coat for metal articles during storage and transit is made by brushing on a solution of lanolin in white spirit or solvent naphtha. Equal weights solvent and lanolin seem satisfactory and there is not much to choose between the two solvents. If a rather harder film is wanted, up to 5% ceresin wax can be added in the case of naphtha solutions; in the case of white spirit up to 10 per cent paraffin wax or up to 3 per cent ceresin wax. It is recommended that the white spirit be of the B.E.S.A. standard, *i.e.*, B.P. 160° to 210° approximately and as to the lanolin, the results of practical tests show little difference between widely different grades.

7.8 lb. lanolin in 1 gal. white spirit give 1.9 gal. solution.

8.3 lb. lanolin in 1 gal. solvent naphtha give 1.9 gal. solution.

Crystal Coating on Steel

Sodium Nitrate	3 lb.
Manganese Dioxide	3 lb.
8% Sulphuric Acid Solution	100 gal.

Protective Coating for Structural Steel

Coal-Tar Pitch	62.5 lb.
Benzol	25 lb.
Aluminum Bronze	12.5 lb.

Priming Structural Paint (Red Lead)

Formula No. 1

Dry Red Lead	20 lb.
Raw Linseed Oil	5 pt.
Turpentine	2 gills
Liquid Drier	2 gills

No. 2

Red Lead Paste in Oil	20 lb.
Raw Linseed Oil	3 pt.
Turpentine	2 gills
Liquid Drier	2 gills

Finish for Steel Surfaces

Tornesit	20 g.
Linseed Oil, Crude, Boiled	10 g.
Indian Red	20 g.
Xylene	30 cc.
High-Flash Naphtha	40 cc.

First Coat Structural Steel Protective Paint

Blue Lead, Paste in Oil	100 lb.
Raw Linseed Oil	2⅜ gal.
Turpentine or Mineral Spirits	1¾ gal.
Drier	¼ gal.

Top Coal Structural Steel Paint

Pigment:

C.P. Chrome Orange	90 lb.
Magnesium Silicate	10 lb.

Vehicle:

Raw Linseed Oil	80 lb.
Spar Varnish	10 lb.
Liquid Paint Drier	10 lb.

Paint:

Above Pigment	70 lb.
Above Vehicle	30 lb.

Red Lead for Bridges

Red Lead	40 lb.
Iron Oxide (95%)	40 lb.
Stand Oil	90 lb.
Raw Linseed Oil	12 lb.
Turpentine	20–40 lb.
Cobalt-Manganese Drier	1 lb.

Tin Can Coating

U. S. Patent 2,009,776

A coating dough for producing a coating material comprises a mixture of 100 parts by weight of rubber solution containing approximately 30 parts by weight of rubber, approximately 15 parts by weight of adhesive ester gum, approximately 3 parts by weight of liquid petrolatum, and approximately 100 parts by weight of zinc oxide.

Tin Lithographing Varnish

Typical construction of this class of product is represented by the following formulae: 54 gal. pale amberol varnish, 34 gal. gum solution, 22 gal. pale mixing varnish, 8 lb. of white vaseline warmed and reduced with 2 gal. of mineral spirits.

The first component of the above blend, is—135 lb. amberol F7 light, 15 lb. WWX Rosin, 34 gal. pale China wood oil, 1½ gal. "Superior" linseed oil, 6 gal. bodied linseed (1½ hrs. at 600° F.), 10 lb. fused lead resinate, 1 ounce cobalt acetate, 8 gal. gum turpentine, 65 gal. mineral spirits.

The second component is a solution of ester gum in mineral spirits, using 12½ lb. of gum to each gallon of solvent.

The third component is 50 lb. ester gum, 3 lb. fused lead resinate, 10 lb. WWX Rosin, 50 gal. pale China wood oil, 50 gal. mineral spirits.

"Tornesit" Paints

First, a base solution is prepared, consisting of 33⅓ per cent Tornesit and 66⅔ per cent high-flash naphtha. To effect solution is a matter of a very few minutes, if the "Tornesit" is added to the solvent.

Second, a concentrated gum solution is made when required.

Third, the pigments are ground in the plasticizer, or if it is insufficient, some of the "Tornesit" base solution is used.

Fourth, if a brushing paint is required, the base solution is thinned to a "Tornesit" content of 21 per cent to 22 per cent by the addition of a solvent mixture consisting of two parts high-flash naphtha and one part xylol. If a spraying composition is desired, the base solution is thinned with toluol to a "Tornesit" content of 11 per cent to 12 per cent. It is advisable to ship even spray paints with a brushing viscosity and send the thinner separately. This helps to keep the pigments in good suspension.

Finally, the gum solution and pigment paste are added to the reduced solution and the mixture is stirred.

"Tornesit" paints may be applied by spraying, dipping, flowing, or brushing. A good film can be obtained by any of these methods.

Following is a brief outline of procedure to be followed, to obtain most satisfactory results in spraying and brushing:

Spraying

"Tornesit" solutions can be sprayed, producing a hard, durable, evenly distrib-

uted film. With present equipment, the spraying viscosity is 40 centipoises, which is somewhat lower than the 75 centipoise spraying viscosity of lacquers.

If the "Tornesit" concentration is kept below 12%, no difficulty will be encountered from "spider-webbing." By the addition of softening agents, gums, and pigments, the solids content will be increased 30–40 per cent, depending, of course, on choice of ingredients.

Brushing

Brushing paints with as high as 57 per cent solids have been applied successfully. For this purpose, a working viscosity of about 250 centipoises is recommended. In brushing "Tornesit" paint, the surface should be well covered with a full brush, avoiding going over the painted area any more than necessary because of the rapid drying of the product. When bodied tung oil is used as the plasticizer in the priming coat, a second coat may be applied to an interior surface after six to eight hours. On exterior work, three to four hours is an ample drying period with the same priming coat.

"Tornesit" Paints

A formula used successfully on tank cars, structural steel and similar surfaces not subject to immersion contains Tornesit plasticized with a drying oil. China wood oil must be properly boiled to avoid wrinkling when a second coat is applied, but no wrinkling occurs with linseed oil. When properly formulated, "Tornesit" paint has good adhesion to metal. Examples of primers having good adhesion are:

	Formula No. 1	No. 2
"Tornesit"	20 oz.	20 oz.
Heavy-Bodied Raw Linseed Oil	10 oz.	10 oz.
Cumar P10	—	5 oz.
Iron Oxide	20 oz.	20 oz.
Silica	30 oz.	—
Xylol	70 oz.	70 oz.

A finish coat used successfully on steel contained:

"Tornesit"	20 oz.
Heavy-Bodied Raw Linseed Oil	10 oz.
Indian Red	20 oz.
Xylol	30 oz.
High-Flash Naphtha	40 oz.

Formulæ containing improperly-bodied oils do not have good alkali resistance, but to withstand immersion in aqueous media, particularly those containing alkalies, formulæ such as the following have been quite successful:

	Formula No. 1	No. 2
"Tornesit"	20 oz.	20 oz.
Methyl Abietate	12 oz.	16 oz.
Cumar V	12 oz.	24 oz.
Indian Red	25 oz.	—
Titanium Dioxide	—	40 oz.

Finishes made to the foregoing formula containing iron oxide have withstood immersion in 5 per cent caustic soda for two months and in 5 per cent hydrochloric acid for three weeks, the use of iron in the pigment probably reducing resistance to hydrochloric acid.

Pliolite Varnish (Paper Coating)

Pliolite Resin	15 g.
Ester Gum Solution (4 # cut)	10 g.
Tricresyl Phosphate	5 g.
Toluol	70 g.

Paper Enamel
U. S. Patent 2,000,453

Glue	20 oz.
Ammonium Hydroxide	2 oz.
Alcohol	4 oz.
Chromic Acid	1½ oz.
Water to make	1 gal.

Moisture Proof Paper Lacquer
British Patent 412,687

Ozokerite	1–2 oz
Dibutyl Phthalate	25–50 oz.
Nitrocellulose	50–75 oz.
Lacquer Solvent	to suit

Paper Watermarking Fluid
U. S. Patent 2,021,141

Canada Balsam	8–20 lb.
Turpentine	5–17 lb.
Colorless Mineral Filler	8–25 lb.
Castor Oil	12–30 lb.

Borax Solution (1%) sufficient to emulsify above liquids.

Water to thin to working consistency.

Rubber Paints
British Patents 407,038 and 417,912

Preparation of Solution "B"

Raw crepe rubber is masticated on a rubber mill, using warm rollers, until the rubber runs coherently round the rollers. Keeping the rubber still milling, 2½ per cent of cobalt linoleate (6 per cent metallic cobalt content) is then added. When the cobalt linoleate is completely dispersed in the rubber, the mixture is

taken off the mill and immediately transferred to a solution mixer, and churned up with an equal weight of white spirit, until a homogeneous mass is formed. This is then poured into drums and is ready for use. The solution should not be kept at a lower concentration than 50 per cent, as there is a tendency for thinner solutions to reduce still further in viscosity and to lose some of their properties.

Preparation of Paint

To prepare a paint, the rubber solution is mixed to the oil with sufficient white spirit to make a medium, which when mixed with the necessary pigments, will form a suitable paste for grinding. Any of the usual pigments and fillers can be incorporated. The ground paste is then thinned with further white spirit to brushing consistency.

As examples of up-to-date formulæ for rubber paints, the following are suggested:

Flat Paints

Formula No. 1

Lithopone	150 lb.
Yellow Ochre	1.5 lb.
Middle Chrome Yellow	1.5 lb.
Solution "B" (above)	20 lb.
Boiled Oil	10 lb.
White Spirit	30 lb.

No. 2

Lithopone	65 lb.
Titanium White	65 lb.
Asbestine	15 lb.
Solution "B"	20 lb.
Stand Oil	10 lb.
Liquid Driers (Lead .033; Cobalt .004)	1 lb.
White Spirit	30 lb.

No. 3

Ultramarine Blue	75 lb.
Asbestine	25 lb.
Solution "B"	28 lb.
Boiled Oil	14 lb.
White Spirit	60 lb.

No. 4

Lithopone	100 lb.
Solution "B"	20 lb.
Ester Gum	10 lb.
White Spirit	50 lb.

No. 5

Lithopone	150 lb.
Stand Oil/Wood Oil (3/1)	10 lb.
Solution "B"	20 lb.
Liquid Driers	1 lb.
White Spirit	30 lb.

Ready-Mixed Gloss Paints

No. 6

Zinc Oxide	100 lb.
Pale Boiled Oil	62.5 lb.
Solution "B"	25 lb.
Terebene	2 lb.
White Spirit	10 lb.

No. 7

Zinc Oxide	50 lb.
Titanium White	50 lb.
Pale Boiled Oil	62.5 lb.
Solution "B"	25 lb.
Terebene	2 lb.
White Spirit	10 lb.

No. 8

Lithopone	80 lb.
Zinc Oxide	20 lb.
Pale Boiled Oil	30 lb.
Solution "B"	15 lb.
Terebene	1 lb.
White Spirit	20 lb.

No. 9

White Lead	100 lb.
Pale Boiled Oil	30 lb.
Solution "B"	12 lb.
Terebene	1 lb.
White Spirit	6 lb.

Cheap Rubber Paint

Molten Rubber	100 oz.
White Spirit	100 oz.
Terebene	12 oz.
Cobalt Terebene	12 oz.
Red Ochre	100 oz.

The defects of molten rubber as a paint vehicle may be obviated by using it in conjunction with oil. That is to say, the varnish is made up partly of molten rubber and partly of linseed oil. A paint made up on a varnish of this description prepared by "cooking up" the oil and rubber together (in the proportion of 50/50) in the presence of driers and thinning with solvents—appears to have good ageing properties and to yield a film which does not readily crack.

* Molten Rubber Varnish	140 oz.
Terebene	5 oz.
Red Ochre	100 oz.

* Molten Rubber	35 oz.
Linseed Oil + Driers	35 oz.
White Spirit	70 oz.

Rubber Water Paint

Glue Solution	25 oz.
Casein Solution	25 oz.
Latex	30 oz.
Lithopone	100 oz.

Drying oils can, if desired, be incorporated with the above, and for some

purposes are an advantage, but tend to discolor the paint more rapidly.

Distempers can also be satisfactorily prepared by using a rubber solution (as used for the oil paints). The solution readily emulsifies with a glue solution, with which the pigments can be incorporated.

The following is an example of this type of distemper:

Glue Solution	20 oz.
* Rubber Solution	16 oz.
Water	25 oz.
Lithopone	100 oz.
* Milled Crepe	8 oz.
Cobalt Linoleate	0.2 oz.
White Spirit	8 oz.

Rubber Frosting Varnish

The addition of rubber solution to china wood oil gives a frosting varnish which will give the desired effect in a more regular manner than when china wood oil is used alone. The rubber solution containing cobalt linoleate is suitable for this purpose.

* Rubber Solution	20 oz.
China Wood Oil	10 oz.
Terebene	1 oz.
White Spirit	10 oz.
* Milled Crepe	10 oz.
Cobalt Linoleate	0.25 oz.
White Spirit	10 oz.

Rubber Flat Paint

Rubber Solution		51 oz.
Milled Crepe Rubber	10 oz.	
Lead Linoleate	1 oz.	
White Spirit	40 oz.	
Stand Oil		10 oz.
Cobalt Linoleate		0.25 oz.
Lithopone		150 oz.
White Spirit		40 oz.

Rubber Gloss Paint

* Rubber Solution	25 oz.
Pale Boiled Oil	62½ oz.
Terebene	2 oz.
Zinc Oxide	100 oz.
White Spirit	10 oz.

Modified rubber solution containing cobalt linoleate (as previously described).

Solution as above, after blowing with air.

* Milled Crepe (including 2½% Cobalt Linoleate, White Spirit 12½)

* Rubber Resin Varnish	25 oz.
Stand Oil	50 oz.
Terebene	5 oz.
Cobalt Linoleate	1 oz.
Zinc Oxide	100 oz.
White Spirit	40 oz.
* Rubber Resin	16⅔ oz.
White Spirit	8⅓ oz.

Rubber Lacquer

Nitrocellulose, Wet (15-20 Sec.)	5.0 g.
Staflex Oil (Plasticizer)	2.5 g.
Ethyl Acetate	10.0 g.
Butyl Acetate	10.0 g.
C.D. Alcohol	10.0 g.
Toluol	62.5 g.

Rubber Repairing Lacquer (For Galoshes)

a.	Alcohol	240 cc.
	Nigrosin (Alcohol-Soluble)	2 g.
b.	Nigrosin-Base BT	50 g.
	Benzol (90%)	180 cc.
	Acetone, Technical	200 cc.

To 350 cc. of this dyestuff solution add

Xylene, Technical	350 cc.
Vinapas B.P. 50T	300 g.

Mix thoroughly, filter through a gauze filter.

Black Rubber Tire Paint

Rosin	3 kg.
Turpentine	3 kg.
Shellac	12 kg.
Sandarac	6 kg.
Alcohol	9 kg.
Turpentine, Venice	3 kg.
Carbon Black	to suit

Elastic Covering
French Patent 762,342

Viscose	15–30 g.
Rubber Latex	50–80 g.
Casein	70 g.
Water	45 g.
Sodium Silicate (36° Bé.)	25 g.
Hardwood Flour	70 g.
Asbestos Fibers	35 g.
Ochre, Uncalcined	40–60 g.

Rubber-Asphalt Lacquer

Crepe Rubber (Shredded)	5–10 oz.
Benzol	90–95 oz.

Allow to soak over night and stir the next day until uniform.

Dissolve

Gilsonite 30–40 oz.

in

Benzol 60–70 oz.

Run the rubber solution into the other solution slowly while stirring.

Linoleum Preservative

Formula No. 1

Linseed Oil (Free from Mucous Substances)

No. 2

Caoutchouc, Crude, Soft	45	g.
Resin, Coumarone	15	g.
Spindle Oil, Refined	940	g.

Melt up together on water bath.

Linoleum Finish

U. S. Patent 1,998,927

Glyceryl Phthalate	12.5	lb.
Toluol	48.1	lb.
Triethanolamine	0.9	lb.

Apply to uncured plastic linoleum body and keep at about 75° C. for 14 days.

Eggshell Enamel

Pigment	50	lb.
Vehicle	50	lb.

Pigment:

French Process Zinc Oxide	80	lb.
Celite No. ON-165	10	lb.
Titanium Dioxide	10	lb.

Vehicle:

Kettle-Bodied Linseed Oil	60	lb.
Mineral Spirits	35	lb.
Liquid Cobalt Drier	5	lb.

Enameling over Varnish

First wash wood work; sandpaper; mix flat paint or enamel undercoat with a little enamel and brush it out thinly. While wet rub with pumice stone and then smooth coating with a brush. Only a small section may be done at a time. If coating sets too quickly add a little linseed oil.

Aluminum Lacquer

Beckosol No. 1, Solid	100	g.
Solvent Naphtha	100	g.
Chlorinated Rubber	20	g.
Xylene	70	g.
Cobalt-Siccative (1% Cobalt)	5	g.

This lacquer is resistant to benzol.

Analytical Weight "Lacquer"

Bleached Shellac	15	g.
Alcohol, Pure	4	fl. oz.

Put in corked bottle; shake and allow to stand for a few days. Filter through fine filter paper.

Brushing Lacquer

U. S. Patent 1,533,616

Alcohol	10	oz.
Ethylene Glycol	10	oz.
Amyl Acetate	5	oz.
Butyl Acetate	10	oz.
Ethyl Acetate	15	oz.
Benzol	15	oz.
Toluol	10	oz.
Xylol	10	oz.
Gasoline	10	oz.
Amyl Alcohol	5	oz.
Butanol	5	oz.

Crystal Lacquer

Nitrocellulose, Wet (½ sec.)	8	g.
Tunguran "A" (Plasticizer)	9	g.
Furfural	12	g.
Butyl Acetate	8	g.
Ethyl Acetate	30	g.
Toluol	33	g.

Lacquer Thinner

Toluene	50	cc.
Ethyl Acetate	18	cc.
Alcohol	12	cc.
Amyl Acetate	20	cc.

Cellulose Solution No. 1

Nitrocellulose (Dry Weight) (½ sec.)	25	g.
Alcohol	10.7	g.
Butyl Acetate	16.1	g.
Toluene	32.1	g.
Ethyl Acetate	16.1	g.

No. 2

Nitrocellulose (Dry Weight) (½ sec.)	35.8	g.
Butyl Acetate	24.8	g.
Toluol	24.2	g.
Ethyl Acetate	15.2	g.

Crystallizing Lacquer Thinner

Ethyl Acetate	1.5	g.
"Cellosolve"	0.5	g.
"Cellosolve" Acetate	0.5	g.
Methanol	0.5	g.
Toluene	7	g.

If using phthalic anhydride, make up solution in cyclohexanone, if using naphthalene dissolve in toluene. The resulting solution is stirred into the lacquer. Variations are made by using mixtures of both, naphthalene and phthalic anhydride.

Crystallizing Lacquer

Formula No. 1

Cellulose Solution No. 1 (see above)	15	g.
Cellulose Solution No. 2 (see above)	0.5	g.

Cyclohexanone	6.5	g.
Ester Gum in Toluol (1 : 1, Weight)	2	g.
Tricresyl Phosphate	0.5	g.
Amyl Acetate	5	g.
Phthalic Anhydride, or Naphthalene Flakes	4	g.

No. 2

Nitrocellulose (½ sec.)	4	g.
Nitrocellulose (100 sec.)	1.5	g.
Butyl Acetate	9.5	g.
Ethyl Acetate	9.5	g.
Cyclohexanone	8	g.
Butyl Propionate	9.5	g.
Toluene	2	g.
Methanol	3.25	g.
Thinner (see below)	9	g.
Ester Gum in Toluol (1 : 1)	7.5	g.
Phthalic Anhydride or Naphthalene Flakes	8.5	g.

The phthalic anhydride is to be dissolved in the cyclohexanone (heat gently), then stir solution into lacquer.

Lacquer for Electric Bulbs

Nitrocellulose	20	g.
Butyl Acetate	0.5	g.
Acetone	50	g.
Alcohol	30	g.
Lithopone, optional or other Pigments.	5–10	g.

Spirit (Furniture) Lacquer

Shellac, Bleached	25	g.
Sandarac	8	g.
Turpentine	4	cc.
Alcohol, Denatured	100	cc.

Floor Paint Lacquer

Formula No. 1

a.	Rosin	100	g.
	Wood Oil, Crude	60	g.
	Linseed Oil	40	g.
b.	Zinc White	4	g.
c.	Litharge	3	g.
	Manganese Oxide-Hydrate	0.5	g.
d.	Lacquer-Benzoline (White Spirit)	160	g.

Heat up *a* together to 180–200° C., then add *b* together with lime (to harden the oils). Heat up to 290° C., take off the fire. When temperature falls to 250–260° C., add *c*.

When cooled, thin with *d*.

No. 2

a.	Kopol No. 600	100	g.
	Wood Oil, Crude	70	g.
b.	Linseed Oil—"Standoil" Thick	30	g.
c.	Lacquer Benzoline	160	g.
d.	Cobalt-Siccative, Liquid (1% Metal Content)	6–8	g.

Heat *a* to 280–290° C., then "quench" with *b*. When cooled to 180° C., add *c*, then *d*.

Floor Lacquer

Copal Ester	100	g.
Linseed Oil—"Standoil"	70	g.
Lead-Manganese Resinate	4	g.
Cobalt, Siccative	1	g.
Thinner	150	g.

Linoleum or Floor Lacquer

Nitrocellulose, Wet (½ sec.)	14	g.
Dewaxed Damar Gum Solution (4# Cut)	12	g.
Paraplex 5-B Solution (80% by Weight) (Plasticizer)	12	g.
Dibutyl Phthalate	2	g.
Toluol	15	g.
Mineral Spirits	20	g.
Butyl Alcohol	10	g.
Butyl Acetate	5	g.
Butyl "Cellosolve"	10	g.

Hat Lacquer

Use 1.25 gal. of the damar lacquer shown below to 3.75 gal. of the second thinner although other thinners can be used.

A lacquer may be made from damar gum and nitrocellulose as follows: 12.5 gal. benzene; 12.5 gal. toluol; 50 lb. 5-sec. nitrocellulose; 10 gal. ethyl acetate; 8.75 gal. butyl acetate; 21.25 gal. dewaxed damar solution.

The yield is 67 gallons of lacquer. Put the five-second nitrocellulose in a 100 gal. barrel or drum and wet it down with the toluol and a low boiling petroleum lacquer thinner. After mixing them, add the ethyl acetate, butyl acetate, and dewaxed damar solution. Stir by hand with a wooden stick, or a power stirrer. The dewaxed damar solution is made quickly by grinding to about 10 mesh: 80 pounds of No. 1 Batavia or Singapore damar gum and adding it to—2.7 gallons of ethyl acetate and—6.43 gallons of petroleum benzene or cleaners' naphtha. Stir this mixture until it is in solution and then as the stirring continues add: 17 gallons of 200 proof alcohol, for cutting shellac. After adding the alcohol, a white waxy precipitate will be formed which will take from one to three days for settling out, depending upon the kind of alcohol used.

The lacquer just described is usually thinned with two parts of a suitable thinner to one part of lacquer before dipping hats into it. The hats are put on racks to dry before shaping on the hot block. A very agreeable non-poisonous thinner is made by mixing: 53% cleaners' naphtha; 15% butyl acetate; 24% No. 1 Special or other similar solvent; 6% butanol; 2% butyl lactate.

Marble Effect Lacquering
German Patent 597,114

Marble effects are gotten by applying the following oil coating over a ground coating of lacquer and then spraying on immediately a very thin lacquer.

Paraffin Oil	40 oz.
Toluol	20 oz.
Alcohol	20 oz.
Ethyl Acetate	20 oz.
Pine Oil	20 oz.
Castor Oil	5 oz.

Non-Inflammable Lacquer

Cellulose Acetate	20 g.
Plasticizer	20 g.
Ethylene Dichloride	120 g.
Ethyl Acetate	30 cc.
Alcohol	20 cc.
Methyl "Cellosolve"	20 cc.
"Cellosolve" Acetate	5 cc.

Pavement Lacquers
Formula No. 1

Rosin, Pale	14 g.
Manila Copal	30 g.
Linseed Oil	22 cc.
Cobalt Linoleate Drier	1 g.
Benzoline	33 cc.

No. 2

a.	Alcohol	40 cc.
	Manila Copal	40 g.
b.	"Galipot" in Alcoholic Solution (1.5 : 1)	20 cc.
c.	Rosin in Alcoholic Solution (2 : 1)	20 cc.

Mix solutions *a, b, c.*

Lacquer Plasticizer

Coconut Fatty Acids	2610 lb.
Sulphuric Acid (66° Bé.)	about 500 lb.
Denatured Alcohol	125 gal.
Caustic Soda (14° Bé.)	
Caustic Soda (30° Bé.)	

Manipulation:

1. The coconut fatty acids must be saponified by boiling with excess of strong caustic soda solution (30° Bé. or stronger) and with addition of considerable water after saponification to prevent solidification of the soap.

2. This soap solution is then decomposed with sulphuric acid, the resulting coconut fatty acids (now being free from neutral oil) are washed with hot water.

3. The fatty acids are heating in a lead lined pressure vessel at 20 to 25 pounds pressure with denatured alcohol and sulphuric acid to esterify to the ethyl ester of the mixed fatty acids. This operation is carried on until the free fatty acid test shows only 6–7 per cent, beyond which point it is uneconomical.

4. The remaining free fatty acids are then neutralized with a 14° Bé. caustic soda solution in a steel tank, allowed to settle over night and the mixed esters pumped off from the soapstock to the still for distillation.

5. The esters are distilled under 25–26 second vacuum at a temperature of 250–425° F. in a steel mill equipped with oil heat or with means for circulating the esters through a direct heater. The condensing equipment is equipped with a sight glass so that the first runs, which are dark in color, may be separated for addition to the next lot of acids to be esterified. When the distillate becomes pale yellow it is suitable for the finished product receiver. The finished product is bleached water white with Fuller's Earth and decolorizing carbon.

Lacquer Thinners
Formula No. 1

Ethyl Acetate	15 oz.
Butyl Propionate	25 oz.
Toluol	60 oz.

No. 2

Ethyl Acetate	5 oz.
Butyl Propionate	10 oz.
Fusel Oil	20 oz.
Toluol	55 oz.
Xylol	10 oz.

No. 3

Amyl Acetate	20 oz.
Butyl Alcohol	10 oz.
Methyl Alcohol	10 oz.
Toluol	60 oz.

No. 4

Benzine	40 oz.
Amyl Acetate	10 oz.
Butyl Acetate	30 oz.
Acetone	20 oz.

Lacquer for Synthetic Plastics

The consistency of a particular lacquer is governed in the first place by the pro-

posed mode of application. In general, spray lacquers contain 12 to 14 per cent nitrocellulose; dipping lacquers contain 8 to 12 per cent nitrocellulose, and brush lacquers contain 14 to 17 per cent nitrocellulose.

Solvent mixtures will also vary with the mode of application. A typical solvent mixture for cellulose lacquers comprises:

Lacquer Solvent

Ethyl Acetate	50 oz.
Butyl Acetate	20 oz.
Butyl Alcohol	5 oz.
Benzol	25 oz.

The following lacquer compositions are recommended for highly polished surfaces:

Formula No. 1

Butyl Acetate	40 oz.
Ethyl Acetate	10 oz.
Alcohol	25 oz.
Benzol	10 oz.

Remainder nitrocellulose, including 10 per cent plasticizer (calculated on the nitrocellulose) such as dibutyl or diamyl phthalate.

No. 2

Nitrocellulose	8 oz.
Shellac	5 oz.
Plasticizer	2 oz.
Alcohol	25 oz.
Butyl Acetate	40 oz.
Butyl Alcohol	5 oz.
Acetone	10 oz.
Glycol Monoacetate	5 oz.

Lacquer Sealers

Formula No. 1

Blown Linseed Oil	1.04 lb.
Nitrocellulose (¼ sec.) Wet	2.22 lb.
Thinner	1 gal.

Lacquer Thinner:

Toluol	61 oz.
Butyl Acetate	26 oz.
Butyl Alcohol	13 oz.

No. 2

Nitrocellulose (½ sec.)	.47 lb.
Nitrocellulose (40 sec.)	.93 lb.
Ester Gum	.93 lb.
Calcium Stearate	.93 lb.
Thinner	1 gal.

Lacquer Thinner:

Coal Tar Naphtha	60 oz.
Butyl Acetate	40 oz.

Sealing Lacquer

Formula No. 1

Celluloid Scrap	10 oz.
Lacquer Solvent	30 oz.
Denatured Alcohol	10 oz.
Barium Sulphate	25 oz.
Zinc Oxide	25 oz.

No. 2

Cellulose Acetate	15 oz.
Methyl Acetate	5 oz.
Lacquer Solvent	30 oz.
Barium Sulphate	25 oz.
Chrome Yellow	25 oz.

No. 3

Nitrocellulose	10 oz.
Ether	15 oz.
Alcohol	25 oz.
Barium Sulphate	25 oz.
Ochre	25 oz.

No. 4

Pyroxylin	15 oz.
Lacquer Solvent	35 oz.
Barium Sulphate	25 oz.
Chrome Orange	25 oz.

Greater adhesion can be secured in above formulæ by addition of 3 % ester gum.

Capsule or Tube Sealing Lacquers

Formula No. 1

Celluloid Scrap	15 oz.
Lacquer Solvent	40 oz.
Alcohol, Denatured	25 oz.
Lampblack	20 oz.

No. 2

Cellulose Acetate	20 oz.
Methyl Acetate	5 oz.
Lacquer Solvent	50 oz.
Zinc Oxide	25 oz.

No. 3

Nitrocellulose	15 oz.
Ether	22 oz.
Alcohol	38 oz.
Ultramarine Blue	25 oz.

Transparent Tube Lacquer

Formula No. 1

Celluloid Scrap	20 oz.
Lacquer Solvent	50 oz.
Alcohol, Denatured	20 oz.
Butanol	8 oz.
Soluble Lacquer Color	2 oz.

No. 2

Nitrocellulose	18 oz.
Butyl Acetate	15 oz.
Lacquer Solvent	68 oz.
Soluble Lacquer Color	2 oz.

Lacquer for Tennis Rackets

Manila Copal	33 g.
Alcohol (93–95%)	66 cc.
Linseed Oil Fatty Acid	1 cc.

Flexible Gloss Wood Lacquer

Nitrocellulose, Wet (¼ sec.)	14 g.
Ester Gum Solution (4# cut)	20 g.
Blown Castor Oil	4 g.
Dibutyl Phthalate	3 g.
Ethyl Acetate	10 g.
Butyl Acetate	10 g.
Butyl Alcohol	7 g.
Toluol	32 g.

Ethyl Cellulose Wood Lacquer

Ethyl Cellulose (Low Viscosity)	8 g.
Dewaxed Damar Gum Solution (4# cut)	12 g.
Dibutyl Phthalate	2 g.
Alcohol	10 g.
Toluol	58 g.
"Cellosolve" Acetate	10 g.

Flat Wood Lacquer

Nitrocellulose, Wet (¼ sec.)	12 g.
Dewaxed Damar Gum Solution (4 lb. cut)	10 g.
Ester Gum Solution (4 lb. cut)	10 g.
Blown Castor Oil	2 g.
Dibutyl Phthalate	1 g.
Halowax No. 1014	5 g.
Ethyl Acetate	5 g.
Butyl Acetate	15 g.
Butyl Alcohol	7 g.
Toluol	25 g.
Xylol	8 g.

Flexible Barrel (Inside) Coating

a.	Gilsonite Asphalt	50 g.
	Benzol	50 cc.
b.	Caoutchouc, Crude	5 g.
	Benzol	50 cc.

Prepare *a* in an iron-kettle with stirrer, if necessary, heat.

Prepare *b* soaking cold for several days. Mix the two viscous solutions, pouring *b* into *a*, stirring vigorously.

Apply repeatedly, allowing each layer to dry well.

Inside Coating for Wood Barrels

a.	Yellow Wax	40 g.
	Colophony	200 g.
b.	Iron Oxide	40 g.
c.	Gypsum (Molding)	10 g.

Melt up *a*, then stir in *b*, finally *c*. Apply liquid, hot mixture with a brush.

Lacquer for Barrels

Rosin	22 lb.
Turpentine, Thick	4 lb.
Turpentine	4 lb.
Alcohol	12 lb.

"Aquarell" Colors

Pigments

White:
Whiting Finest, or China Clay.

Pale Yellow:
Pale Yellow Lake, or Yellow Lake, Blended.

Yellow:
Yellow Lake, Martius Yellow, Ochre.

Pale Orange:
Orange Lake, Blended to get Lighter Colors.

Orange:
Orange Lake.

Rosa (Pink):
Alizarin Lake, or "Echt-Rot" (Genuine-Red), Blended to Obtain Lighter Colors.

Red:
Alizarin Red, Martius Red.

Pale Brown:
Terra di Siena, Blended

Brown:
Caput Mortuum (Iron Oxide).

Dark Brown:
Umbra, or Cassel Brown.

Violet:
Brilliant Violet Lake.

Pale Blue:
Blue Violet Lake, Blended.

Blue:
Blue Lake.

Dark Blue:
Dark Blue Lake.

Pale Green:
Green Lake, Blended.

Green:
Green Lake.

Gray:
Black Lake, Blended.

Black:
Black Lakes.

The blending, to get paler shades, is done by mixing the lake or pigment with white chalk.

Manufacture of "Aquarell" Colors

(Water soluble, applied with brush)

Solution for binding of the pigments in the color-paste:

Formula No. 1

Gum Arabic	26 g.
Water, Distilled	51.9 g.
Glycerin (28° Bé.)	8 g.
Glucose Solution (1 : 1)	10 g.
Beef-Gall, Prepared	4 g.
Moldex or Other Preservative	0.1 g.

Dissolve gum powder in cold water, stir, then heat to get complete solution. Add preservative, then glycerin, glucose solution, beef-gall. Filter, when cooled, through a percolator-cloth. (See No. 2)

No. 2

Dextrin, White	40 g.
Water, Soft or Distilled	41.8 g.
Borax, Crystallized	2 g.
Glycerin (28° Bé.)	6 g.
Glucose Solution (1 : 1)	10 g.
Moldex or Other Preservative	0.2 g.

Make dextrin paste in cold water, then warm to get clear solution, add preservative and borax, then glucose-solution and glycerin.

Add the amount of water lost by evaporation (also in No. 1).

Alkali and Acid Resisting Paints

Formula No. 1

Chlorinated Rubber	18 lb.
Toluol	43 lb.
Turpentine	9 lb.
Tetralin	4 lb.
Wood Oil Stand Oil	9 lb.
Red Pigment	17 lb.
Amyl Acetate	1 lb.

No. 2

Chlorinated Rubber	18 lb.
Toluol	45 lb.
Gutta-Percha Resin	11 lb.
Wood Oil Stand Oil	2 lb.
Amyl Acetate	6 lb.
Tetralin	5 lb.
Paint Graphite	11 lb.
Carbon Black	1 lb.

Fireproof Paints
(for Wood)

Barium Sulphate	25 oz.
Zinc White	1 oz.
Water	20 oz.
Waterglass	25 oz.

Heat Sensitive Paints

Certain chemicals in form of paints can be employed for the detection, or determination, of temperature fluctuations of a surface. Thus, the double iodide of silver and mercury, which is yellow at ordinary atmospheric temperatures, is colored dark orange on heating, being brick red at a temperature of 70 to 80° C. The double iodide of copper and mercury is bright red at ordinary temperatures, turning chocolate brown at 70° C. and black at 100° C. If the heating of the paint films is not extended too far, the original color of the paint returns on being cooled back to ordinary atmospheric temperatures. A process recently patented in France employes a mixture of two substances, which react upon each other at elevated temperatures only, lead sulphide and barium superoxide. In a suitable carrier this mixture is black at ordinary temperatures, turning gray on heating. This change is due to the formation of lead sulphate in the mixture.

Lime Resistant Paint

Complete protection against corrosion by hot lime-water and acetylene residues is obtained by a paint containing 16 per cent chlorinated rubber, 44 per cent xylene, 35 per cent lithopone, and 5 per cent tritolylphosphate.

Luminous Paint

Swiss Patent 172,076

Sandarac	36 g.
Rosin	18 g.
Paraffin	4 g.
Alcohol	35 g.
Petroleum Ether	10 g.
Tricresyl Phosphate	1 g.
Benzoin, Gum	2 g.

Mix with gentle warming until dissolved. Dehydrate with quick-lime and filter.

65 grams of above are mixed with:

Strontium Sulphide	35 g.

Mildew Preventatives for Paint

The addition of any of the following per 600 pounds of paint is advisable:

Mercuric Chloride	1 lb.
Sodium Silico Fluoride	6 lb.
Ammoniated Mercury	2 lb.

Non-Caking Pigments

Pigments are prevented from caking and are more readily dispersed in either oil or water if they are suspended in a dilute dispersion in water of diglycol stearate or glyceryl monostearate and then dried. A film of waxy material is formed around each pigment particle. This film is both oil soluble and water dispersible.

Marble-Effect Dipping Paint

Beautiful, marble-like effects are obtained by dipping objects into many-colored paints floating upon the surface

of water. In order to float on water, the paints used have to weigh less than 8.33 pounds per gallon. Assuming that a varnish is used which weighs 7 pounds per gallon, the following table gives the number of pounds of pigment which, when ground into 1 gallon of varnish, will yield a paint of sufficiently low weight to float on water, and have good hiding.

Chrome Yellow	1.25
Chrome Green	1.00
Prussian Blue	0.50
Para Red	0.50
Aluminum Bronze Powder	1.50
Gold Bronze Powder	1.50
Carbon Black (High Strength)	0.50

The procedure is important. Select a container which is wide enough and deep enough to hold the largest object to be dipped. Fill the container with water at room temperature. By means of a rod or dropper place a few drops of a colored paint here and there on the surface of the water. Near these drops or upon them place drops of a contrasting colored paint. Three, four or even five different colors may be used, but an excess of paint should be avoided. The colors will spread about, mingling with each other. They may also be blown gently. Hold the object to be decorated in such fashion that the entire outside surface is exposed. Immerse it slowly into the colors and into the water, turning it a bit at the same time. Blow the remaining colors aside in order to withdraw the object without having it traverse the colors again. The designs produced in this manner will always be different from each other, and are almost impossible to reproduce by hand painting.

Oiticica Oil Emulsion Paint
U. S. Patent 1,998,845

Oiticica Oil	120 oz.
Lead Oxide	6 oz.
Manganese Dioxide	2 oz.

Heat to 250° C. and then reduce to 200° C. and add

Potassium Silicate	13 oz.
Milk of Lime	16 oz.
Water	sufficient

Agitate violently until cool.

Paint Perfume

Vanillin is dissolved in turpentine or linseed oil. One part of vanillin is used to 2000 parts of paint to cover objectionable odors.

Plastic Paints

Zinc White or Lithopone	18.15 oz.
Water	7.5 oz.
Hide Glue	0.68 oz.
Linseed Oil, Pale Boiled	3.8 oz.
Rosin (WW or WG)	3.6 oz.
Benzol	3.8 oz.
Zinc Sulphate	0.12 oz.

If a hard dry product is wished, add gypsum. Treat with water until pasty.

Synthetic Resin Enamel Paints
Formula No. 1

Zinc Oxide (White Seal)	400 lb.
Thin Stand Oil	180 lb.
Turpentine	100 lb.

Pug well and grind four times, then add:

China Wood Oil Varnish, containing 25 per cent Synthetic Resin, equivalent to	88 lb.
Thick Stand Oil	40 lb.
Turpentine	64 lb.
Cobalt Linoleate (Liquid)	20 lb.

This enamel dries in from 15 to 18 hours.

No. 2

Titanium Oxide	300 lb.
Zinc Oxide	300 lb.
Thin Stand Oil	180 lb.
Synthetic Varnish	250 lb.
White Spirit	100 lb.
Cobalt Linoleate	10 lb.

No. 3

Zinc Oxide	300 lb.
Titanium Oxide	300 lb.
Thin Stand Oil	280 lb.
Synthetic Varnish	150 lb.
White Spirit	100 lb.

Synthetic Resin for Paints
Canadian Patent 348,347

Castor oil 500 and drying oils 500 parts by weight are mixed and distilled until the residue of polymeric esters is approximately 85% of the original mixture. The retort is cooled below 290° and 800 parts of glycerol is gradually introduced. The mixture is heated for a short time well above the boiling point of water but below the boiling point of glycerol, and then 1200 parts of phthalic anhydride is gradually added, the temperature being maintained about midway between the boiling point of phthalic anhydride and that of water. When the mixture is clear and homogeneous it is run into cooling pans or into mixing tanks to be thinned with solvents.

Tar and Asphalt Paints

Formula No. 1

Pine tar 120 l., rubber (small pieces) 1300 g., gutta-percha (small pieces) 1600 g., shellac 2700 g., copal varnish 4.5 l. When the varnish has been incorporated 45 l. of linseed oil heated separately to nearly the same temperature are added slowly.

No. 2

Asphalt 40 g., fossil resin 10 g., heat-thickened linseed oil 8 g., liquid driers 20 g., turpentine 60–70 g.

Paint for Marking Wood Boxes, Barrels, etc.

Formula No. 1

Gum Arabic	10 g.
Soda Ash	1 g.
Glycerin	1 g.
Water	40 g.

Lampblack or pigment, as much as needed.

No. 2

Waterproof:

Shellac, Ruby	60 g.
Borax	60 g.
Water	750 g.

Dissolve boiling, and add:

Gum Arabic	60 g.

Pigment or Lampblack, as much as needed.

Cement Water Paint

German Patent 575,895

Silica	40 kg.
Pyrolusite	5 kg.
Whiting	40 kg.
Cement	15 kg.

Grind very finely and mix into the following solution:

Casein	50 kg.
Borax	30 kg.
Water	150 kg.
Rosin Emulsion	20 kg.

Wool Fat Emulsion Paints

German Patent 612,715

Ammonium salts of high molecular fatty acids derived from drying or semi-drying oils have been claimed to be exceptionally valuable emulsifying agents for paint compositions incorporating both wool fat and non-water-soluble ingredients, such as resins and drying oils. Not only are the resulting coatings far more water-resistant than those of ordinary wool fat coatings, but the employment of an aqueous medium obviates some of the drawbacks of solution in organic solvents. The process can be illustrated with reference to an emulsion of crude wool fat, refined tung oil and rosin, which are melted up in the respective proportions of 360 : 40 : 250, the melt being incorporated with 43 parts of ammonium solution, 100 parts alcohol and 1207 parts water and the resulting emulsion agitated till cold. The product at this stage, a viscous, yellowish-white emulsion, may be directly employed as a paint. An example of a quick-drying paint comprises 1000 parts emulsion, 80 parts chrome oxide, 150 parts titanium white and 15 parts of a 33 per cent solution of a cobalt-lead-manganese drier. Such a paint is stated to reach surface dryness within two hours after brushing on any type of surface, and admirably resists the action of a condensed steam-laden atmosphere.

Specialty Paints

French Patents 44,177 and 756,535

Under-Water Paint:

Water	500 kg.
Tar	300 kg.
Caoutchouc Solution	200 kg.
Rosin	200 kg.
Benzene	100 kg.
Alum	2 kg.

"Very Brilliant" Paint:

Alum	12 g.
Aluminum Bronze	5 g.
Salt	30 g.
Sugar	5 g.
"Fatty" Lime	50 g.
Water	400 g.
Oil	400 g.
Rosin	200 g.
Benzene	150 g.
Mica Powder	20 g.
Milk Whey	100 g.
Caoutchouc Solution	200 g.
Liquid Drier	150 g.
Pigments	10–15 g.

Paint and Varnish Remover

Formula No. 1

Amyl Acetate	15 lb.
Acetone	14 lb.
Benzol	11 lb.
Methanol	12 lb.
Paraffin Wax	2½ lb.

No. 2

Whiting	21 lb.
Acetone	21 lb.
Denatured Alcohol	21 lb.
Benzol	23 lb.
Paraffin Wax	1¼ lb.

No. 3

A low priced and effective remover may be made up as follows:

Ethyl Acetate	30	oz.
Benzol	40	oz.
Methanol	27.5	oz.
Paraffin Wax	2	oz.
Methyl Salicylate	0.5	oz.

The paraffin is melted and poured into the benzol. The other solvents are mixed and then the benzol wax solution added to same while mixing vigorously.

Removing Plastic Paint

Mix one pound sal soda and two pounds hydrated lime and one-fourth of a pound of table salt. Add enough water to this mixture to produce a fairly heavy paste. Apply the paste with a fiber brush, and leave it on until the old material is softened, when it may be scraped off. If the paste material should become nearly dry before the old material is soft enough to be easily scraped off, apply the paste material again, but always be sure you do not get this caustic paste on the woodwork or floors, as it would injure them. When all the old material has been scraped off, wash the surface and rinse it until it is perfectly clean, and allow it to become dry before applying the first coat of paint.

Finish Remover
U. S. Patent 1,974,744

Acetone	35	oz.
Ethyl Acetate	15	oz.
Denatured Alcohol	10	oz.
Benzol	10	oz.
Oxidized Pine Oil	10	oz.
Diethyl Phthalate	20	oz.
Cellulose Acetate	4	oz.

Varnish Remover, Liquid

Methanol	30	gal.
Phenol (90%)	5	gal.
Light Coal Tar Oil	65	gal.

Varnish Remover, Paste

Crude Vaseline	50	gal.
Phenol (90%)	45	gal.
Fusel Oil	20	gal.
Wood Flour	80	lb.

Shellac Finish

Shellac	250	g.
Dragon's Blood	50	g.
Alcohol	750	g.

Mix until dissolved, while warming on water bath.

Copal (Powdered and Exposed to Air for a Few Weeks)	60	g.
Alcohol	250	g.

Dissolve by mixing on water bath and then add:

Chalk, Precipitated	180	g.

Then mix with first solution.

Flat Indoor Shellac Lacquer

Copal	13½	oz.
Alcohol	13½	oz.
Shellac T.N.	7	oz.
Alcohol	18	oz.
Bone Oil	3	oz.

Flat Outdoor Shellac Lacquer

Shellac, Orange T.N.	50	oz.
Alcohol	200	oz.
Bone Oil	5	oz.
Oxalic Acid	½	oz.

Finishing Shellac Lacquer

Shellac, White Refined	100	oz.
Alcohol	125	oz.
Butyl Alcohol	4	oz.
Bone Oil	1	oz.

Brushing Finishing Shellac Lacquer

Copal	2½	oz.
Alcohol	2½	oz.
Sandarac	½	oz.
Alcohol	1	oz.
Shellac, T.N.	2.2	oz.
Alcohol	3.3	oz.
Acaroid Red, Alcoholic (1 : 1)	1	oz.
Acaroid Yellow, Alcoholic (1 : 1)	½	oz.
Butyl Alcohol	½	oz.
Castor Oil	½	oz.
Bone Oil	¼	oz.

Shellac Floor Finish

Shellac, Orange	280	g.
Linseed Oil Varnish, Pale	80	g.
Ochre, Pale or Dark	50	g.
Alcohol	1	l.

Stir altogether, let stand over night.

Floor Refreshener

5 lb. Shellac "Cut"	¼	gal.
Denatured Alcohol	¾	gal.

This mixture is applied with a mop. The alcohol cleans and at the same time there is left a thin film of shellac which adds lustre to the floor.

Shellac Polish

Lac, Button	18 oz.
Alcohol	72 oz.
Shellac, T.N.	9 oz.
Sandarac	4 oz.
Benzoin, Gum	4 oz.
Turpentine, Venice	5 oz.

Water Shellacs

1. Bleached "Pig-Tail" Shellac

Water	645 g.
Borax	55 g.
"Pig-tail" Shellac, Ground, 20% Water	300 g.

2. Bleached Shellac Powder

Water	705 g.
Borax	55 g.
Shellac Powder, Dry	240 g.

3. Ruby and Orange Shellac

Water	700 g.
Borax	50 g.
Ruby or Orange Shellac (Free of Rosin and Wax)	250 g.

Solution in above formula is hastened by warming and stirring.

Water Resistant Shellac

Add 2–3% of urea or thiourea to solution of shellac in alcohol.

Bleaching Shellac

Lac may be bleached by dissolving it in 2.5% sodium carbonate solution at 60–70° and, after filtration and cooling to air temperature, adding a solution prepared by passing chlorine into a solution containing 12.5% of caustic soda and 2.5% of sodium carbonate. The latter should contain 6–8% of available chlorine and, if of pH 10–10.5, does not require storing in a cool place. The amount of such a solution necessary for bleaching indicates a chlorine requirement of 10–14% on the weight of lac, and a yield of 93–95% is obtained. The bleached lac may be recovered by the slow addition, with stirring, of 1:20 sulphuric acid, the precipitate being then collected, washed, and dried in vacuo over sulphuric acid. The product is freely soluble in cold 97% alcohol, and the solubility does not alter on prolonged storage in air. The bleached material contains 2.3–3.1% of moisture, 0.98–3.52% chlorine and has a saponification value 236.0–256.7, acid value 70–68–83–52, and iodine value 3.9–5.0.

Substitute Shellac Solutions

The substitutes for shellac solutions are of three types:

1. Substitute for wax-free shellac solution.
2. Substitute for white shellac solution.
3. Substitute for orange shellac solution.

The base for all three is the same, namely a solution of a cheaper alcohol-soluble resin in completely denatured alcohol. At the present time a soft Manila gum is used, and a 6-lb. cut represents the maximum concentration normally made. To prevent loss by evaporation, as well as to avoid the hazard of volatile alcohol vapors, a closed tumbler is used, in which is placed one gallon of alcohol for every six pounds of the Manila gum. When solution is complete, the tumbler is emptied and the solution allowed to settle. The clear supernatant solution represents a substitute for wax-free shellac solution.

White and orange shellac solutions contain a cloud of suspended wax which is inherent in the material and insoluble in alcohol. To duplicate the waxy appearance a preparation of carnauba wax may be employed. A quick and safe method of preparing the wax is as follows:

Imitation Shellac "Cloud"

Dissolve 5 lb. of carnauba wax in one-half gallon of blown castor oil. Since carnauba wax melts at 84–86° C., a steam-jacketed kettle may be used. If a direct fire is used, the flame must be extinguished before proceeding further with the formula. Add slowly and with constant stirring one-half gallon of turpentine, followed by one-half gallon of denatured alcohol. A soft yellowish-white paste will form. This paste, added to a solution of 95 lb. of Manila gum in 15 gal. of alcohol, represents a 6-lb. cut in which the wax constitutes 5% of the total solids. Less paste may be used, but not more. The castor oil serves not only as a solvent for the wax, but also as a plasticizer.

The waxed product is a substitute for white shellac. It may be colored by means of an orange alcohol-soluble aniline dye, thus forming a substitute for orange shellac.

Shellac Substitute

U. S. Patent 1,942,413

Batu (Galla-Galla) Gum	18–20 oz.
Rosin	10–20 oz.

Heat to 260° C. Add:	
Calcium Oxide	1–4 oz.

Heat to 320° C. and stir till dissolved. Cool and "cut" with varnish solvents to give a shellac substitute solution.

Oiticica Varnish

An oiticica oil varnish cooked under the same conditions as a similar tung oil varnish is lower in viscosity, which is an advantage. If the temperature is taken over 250° C. frothing occurs and this has to be carefully watched.

By blowing oiticica oil for 30 minutes at 220° C. a thick light-colored oil is formed which will be comparable with blown linseed oil. Oiticica oil varnishes have a less characteristic odor and are less noticeable in closed spaces.

To establish the technical value of oiticica oil, tests have been made with varnishes with a natural or artificial resin base and mixtures on the one hand of tung oil and linseed oil, and on the other of oiticica oil and tung oil, the latter being in the ratio of one part to two respectively. Heating is done at 315° C. and maintained until the mixture has the correct body.

Ester Gum Varnishes

Formula No. 1

Ester Gum	100 lb.
Tung Oil	198 lb.
Linseed Oil Heated for 2 Hours	36 lb.
Solvent Naphtha	84 lb.
White Spirit	250 lb.

Driers are added in the proportion of 0.5% lead and 0.035% cobalt. This gives a varnish which becomes tacky in 45 minutes and dries in about 3 hours. The film is resistant to cold and boiling water. The film is not resistant to combustion gases. The Gardner-Holt viscosity is D and the color 11.

No. 2

Ester Gum	100 lb.
Oiticica Oil	156 lb.
Tung Oil	78 lb.
Solvent Naphtha	84 lb.
White Spirit	250 lb.

Driers are used in the same proportion, i.e., 0.5% lead and 0.035% cobalt. This varnish becomes tacky in 2 hours and perfectly dry in about 8 hours. The film is resistant to cold water but not to boiling water when it whitens but becomes transparent again.

Pharmaceutical Cellulose Varnish

French Patent 777,999

A varnish containing, e.g., benzylcellulose 5–18 g., benzine 18–40 g., toluene or xylene 25–45 g. and butyl acetate 20–35 g., or benzylcellulose 2–12 g., benzine 50–80 g., and ether 25–80 g., used for pharmaceutical or toilet purposes, is contained in a collapsible tube and used as required.

Electrically Conducting Varnish

Formula No. 1

Aluminum Bronze Powder	240 g.
Synthetic Resin Varnish	1 l.

No. 2

Copper Bronze Powder	120 g.
Lacquer	1 l.

Cold "Cut" Synthetic Resin Varnish

Rezyl No. 14	10 g.
Methanol	50 cc.
Toluol	50 cc.

Allow to stand over night and then stir.

Leather Roller Varnish

Venetian Red	4 lb.
Ground Blue	5 lb.
Vinegar	15 pt.
Glycerin	75 cc.
Glucose	150 cc.
Oil of Cloves	25 cc.
Methyl Salicylate	25 cc.

Mu Oil Varnish

Mu Oil	200 oz.
Modified Phenolic Resin	100 oz.

Heat with stirring to 570° F.; keep at this temperature for 6 minutes; cool to 350° F. and dilute with 250 oz. petroleum spirits and add 5½ oz. lead naphthenate and 0.1 oz. cobalt naphthenate.

Mopping and Wiping Varnish

Because varnishes of this type leave a very thin film, it is essential that they be made of tough and durable ingredients. The average floor or furniture varnish, if thinned to wiping consistency, is unsuitable. A high grade product consists of a blend of 3 or 4 pints of the following varnish *a* with 1 pint of varnish *b*.

a. Bakelite XR-4070	100 lb.
China Wood Oil	16 gal.

Body for 1 hour at 450° F. Reduce with 20 gal. mineral spirits, 5 gal

xylol, 3 gal. dipentene, 2 gal. high boiling hydrogenated naphtha and 3 gal. gum spirits of turpentine.

b. Substitute Bakelite BR-820 in place of XR-4070 in Formula *a*, and body with the wood oil at 400° instead of 450°.

Driers are unnecessary.

High Gloss Transparent Printing Varnish

British Patent 426,753

Ester Gum	120 oz.
Tung Oil	40 oz.
Linseed Oil (Half Boiled)	40 oz.
Mineral Spirits	6 oz.
Cobalt Linoleate	5 oz.

The above may be colored with a suitable amount of rhodamine base dissolved in olein, Berlin blue, alizarin madder lake, milori blue or Sudan yellow.

Wrinkle Finish Varnish

U. S. Patent 1,934,034

Tung Oil	100 oz.
Rosin	5–10 oz.

Heat for 2 to 8 hours at 177–290° C. Cool and dissolve in an equal weight of high-flash naphtha.

Limed Rosin

The apparatus and procedure vary somewhat, but the following is usual practice: One hundred and twenty-five pounds of resin are melted in a cylindrical flat-bottomed copper vessel 36 inches in height and from 30 to 36 inches in diameter. The vessel has a loose cover provided with a small chimney and an opening for the stirring rod. It is mounted on an iron truck, the platform of which is about 2 inches from the floor. The truck is then wheeled to a position under a chimney and over a furnace, which is located beneath the floor. The resin completely melts in about a half hour. It is at this point that the use of lime enters.

Lime is added, gradually, to the melted resin with the temperature at about 350° F. Theoretically, about 13.6 pounds of hydrated lime would be required, but it is inadvisable to completely neutralize the resin. In actual practice 8 to 10 pounds of hydrated lime are used. This reduces the acidity of the resin from about 160 to 65. After stirring and heating for a short while, the treatment with lime is completed.

Wood Filler

Shellac (if for Transparent Wood Filler Use Bleached Shellac)	4	lb.
Methylated Spirits	1	gal.
Barytes	20	lb.
Silica	10	lb.
Raw Linseed Oil	¼	gal.

Dissolve the shellac in the methylated spirits and add the linseed oil. Mix the barytes and silica together dry, and stir into the shellac varnish. Grind to a smooth paste and adjust the consistency with additional barytes and silica mixture or shellac varnish. Store in airtight containers.

Filler-Undercoat for Shellac

Mixing powdered boracic acid, 5 g., with each ounce of shellac to be used as an undercoat on wood causes the shellac to dry very hard so that it serves as a filler as well as an undercoat.

Porous Wood Sealer

One hundred thirty-five pounds of 400-mesh Silica, 65 lb. Bentonite, 10 gal. of Congo Copal Varnish, 2½ gal. Pontianak Gum Varnish, 2½ gal. Nevindene Solution, 10 gal. Light Naphtha, 5 gal. Lacquer Thinner, ½ gal. Concentrated Cobalt Drier. Nevindene solution is (basis) 6 lb. of Nevindene resin cut cold in 1 gal. of mineral spirits.

The protective covering should be a coat of aluminum paint and advisedly two coats of regular oil-type house paint. The Aluminum Primer recommended is: 72½ gal. of an 80-gal. Tung/Ester Varnish, 10 gal. Boiled Linseed Oil, 7 gal. Mineral Spirits, ½ gal. Lead-Manganese Concentrated Drier, 135 lb. Paste Aluminum (or powder).

Non-Penetrating Plaster Sealer

Pigment	45 lb.
Vehicle	55 lb.
Pigment:	
Titanium-Calcium Pigment	62 lb.
Metronite	37 lb.
Aluminum Stearate	1 lb.
Vehicle:	
Bodied Linseed Oil	50 lb.
Mineral Spirits	45 lb.
Liquid Drier	5 lb.

Wood Filler for Ground Polishing

German Patent 607,521

Shellac Wax	10 oz.
Carnauba Wax	5 oz.

Pumice Meal	100 oz.
Sandarac	100 oz.
Blown Castor Oil	10 oz.

Melt together until uniform and powder after cooling.

American Walnut Graining Color

Ivory Black	2 oz.
Van Dyke Brown	4 oz.
Burnt Umber	2 oz.
Bolted Whiting	1 oz.
Water	½ gal.

Imitating Old Copper Finish

After application of priming coat use

White Lead	6 lb.
Chrome Yellow, Medium	12 oz.
Venetian Red	1½ lb.
Burnt Umber	4 oz.
Linseed Oil	4¼ lb.
Turpentine	4¼ lb.
Drier	to suit

After applying above paint, allow to dry and use a coating of copper bronze powder thinned with equal parts of spar varnish and turpentine. When this coat is dry apply a glaze made from chrome green, medium, thinned with equal parts of raw linseed oil and turpentine plus a small amount of drier. While the glaze is still damp wipe it here and there to produce a mottled effect.

Liquid Oil Graining Color

Raw Linseed Oil	⅖ gal.
Turpentine	⅗ gal.
Drier, Liquid	½ pt.
Beeswax, Yellow (Shavings)	⅔ oz.

Warm together and mix until clear.

Wood Stain

U. S. Patent 1,977,345

Dye, Water Soluble	4 oz.
Diethylene Glycol Ethyl Ether	5 oz.
Alcohol	80 oz.
Ethylene Glycol Methyl Ether	15 oz.

Wood Stain

U. S. Patent 2,000,121

Diethylene Glycol Mono-ethyl Ether	1 oz.
Methyl Alcohol	9 oz.
Toluol	6 oz.

This composition may be utilized with from 2 to 2½ oz. of the particular dye to 1 gal. of the composite solvent. The amount of dye utilized depends on the particular dye itself and its degree of concentration, and the depth of color required in the particular stain. Further, the strength of the dye stain may be varied by the amount of diethylene glycol mono-ethyl ether utilized.

In making up these compositions, the aniline dye or stain, such as the nigrosines, may be allowed to stand with the diethylene glycol mono-ethyl ether until the dye dissolves, after which the other ingredients may be added.

Coloring of Light Wood to Imitate Ebony

A vacuum process is essential for good impregnation of wood with coloring substances. Aqueous solutions are preferable where possible on grounds of low price, high vapor pressure (which assists impregnation) etc. Woods for this ebonizing process, in order of suitability are: apple, pear, hazel, maple, beech and birch. The following are recipes for ebonizing:

Formula No. 1

Gall-nut solution containing a few drops of ammonium vanadate solution.

No. 2

3.60 kilograms aniline hydrochloride, 1.80 kilograms potassium chlorate, 40 liters water, 0.250 liter hydrochloric acid, 4.20 grams ammonium vanadate.

No. 3

Four kilograms carbon black, 18 liters shellac Japan lacquer, 18 liters turpentine.

No. 4

1,200 kilograms carnauba wax, 3 kilograms ceresin, 30 grams oil-soluble nigrosine, 10 liters turpentine.

Auto Top Dressing

Orange Shellac	4 oz.
Denatured Alcohol	1 gal.
Castor Oil	½ oz.

If a black finish is desired add nigrosine to give the desired color.

Butter Taint Prevention Coating

Tubs are coated with following:

Prime Lactic Casein	50 oz.
Borax	7.5 oz.
Water	300 oz.

Stir and warm gently until smooth.

Candy Glazes

Formula No. 1

Sandarac	125 g.
Benzoin, Sumatra	125 g.

Turpentine, Venice	10 g.
Alcohol	740 g.

No. 2

Benzoin, Sumatra	200 g.
Balsam, Peru	5 g.
Alcohol	800 g.

No. 3

Benzoin, Sumatra	150 g.
Shellac, Refined	50 g.
Vanillin	1 g.
Alcohol	800 g.

Protective Food Coating
French Patent 780,762

Lactic Casein	100 g.
Borax or Sodium Phosphate	16 g.
Sodium Bicarbonate	32 g.
Glycerin	34 g.
Distilled Water	820 g.
Gelatin	8 g.

This may also be applied to aluminum or tin foil for use on foods.

Protective Coatings for Sausages, etc.
Formula No. 1

Gelatin	5 g.
Salt	2 g.
Saltpeter	1 g.

No. 2

Gelatin	5 g.
Glycerin	1 g.

No. 3

Pentosan Resin	3 g.
Gelatin	1 g.

No. 4

Aqueous Solution of Stahr, or Agar-Agar, or Gelatin, ½–2% Formic Acid.

No. 5

Tallow

No. 6

Alum	1 g.
Olive Oil	1 cc.
Shellac	16 g.
Alcohol	65 cc.

No. 7

Paraffin	35 g.
Colophony	62.8 g.
Whiting	2.2 g.

No. 8

Linseed Oil	60 g.
Colophony, Shellac, Glycerin, or Wax	40 g.

No. 9

Glue, Gelatin or Isinglass, boiled in a little vinegar.

Laboratory Table Top Stain
Solution No. 1

Potassium Permanganate	20 g.
Copper Sulphate	20 g.
Water	1 l.

Heat to about 60–70° C. and apply to clean desk top, and follow immediately with solution No. 2.

Solution No. 2

Hydrochloric Acid (sp. gr. 1.2)	150 cc.
Aniline	150 cc.
Water	700 cc.

Heat to about 60–70° C. and apply over No. 1.

When the desk top is dry it may be rubbed with linseed oil in the usual manner.

Red Stamp Pad Ink

Fuchsin	1 oz.
Glycerin	32 oz.
"Lysol"	⅛ oz.
Acetic Acid	1 oz.
Denatured Alcohol	1 oz.
Water	1 oz.

Protector for Polished Surfaces
French Patent 778,389

Water	150 cc.
Linseed Oil	200 cc.
Alcohol	450 cc.
Sulphuric Acid	20 cc.
Shellac	30 g.

Coating for Old-Painted Surfaces
Swiss Patent 173,070

Trichlorethylene	25 cc.
Polishing Lacquer	25 cc.
Benzoline	25–30 cc.
Lithopone, as Pigment	optional

Preparation of Oil Pastes from Pigment-Water Pulp

The addition of linseed oil of acid value about 10 will cause the separation of water from a pulp of white lead-in-water. Agitation and friction are necessary in order to insure contact of the oil with the pigment and in order to express the maximum amount of water.

With other pigments, particularly those whose affinity for oil is less striking than that of white lead, transfer from the water phase to the oil phase may be

accomplished by one or more of the following means:

1. High acid linseed oil.
2. Polymerized linseed oil.
3. Linseed or China wood fatty acids.
4. Addition of various chemical agents.

As an example of method 4 (Patented), 15.5 parts of linseed oil (acid value 7) or of other drying oil (acid value greater than 4) are added gradually at 82–88° C., with vigorous agitation, to a suspension of 100 parts of lithopone in 200 parts of water which also contains tri-sodium phosphate or other alkaline saponifying agent. The water separates in the upper layer after 10 to 30 minutes' further agitation.

Strong Lead Oil for Black Paints

Varnish linseed oil is heated with continual stirring until at the end of an hour the temperature reaches 570° F. (=300° C.) and is held at this temperature for a further 3 to 4 hours, when the heat is closed down. Finely powdered white lead is then added slowly on a falling temperature, commencing at about 525° F. (=274° C.), in the proportion of 4½ lb. of white lead to every 100 lb. of oil, about 2 hours being occupied in adding the white lead. So far, it will be observed, the process will have occupied practically one working day. On the following day the oil is heated up again, care being taken to avoid local heating in the early stages until the whole mass becomes quite fluid. Heat is then increased until a temperature of 535° to 545° F. (=280° to 285° C.) is reached, at which the oil is held until the body required is attained. The purposes for which oil of this type is used demand as a rule that the product when cooked shall "string" very strongly when tested on glass. Gums or blacks with which it may be cooked afterwards are usually expected to "pill" between the finger and thumb.

Flatting Oil

Linseed Oil	15 lb.
Solvent Naphtha or Turpentine	85 lb.
Drier	to suit

Add to the following lead paste in proportions of 2½ gal. above oil to 100 lb. lead paste:

White Lead	92 lb.
Linseed Oil	8 lb.

Black Iron Oxide Pigment

Austrian Patent 141,130

Ferrous Sulphate	240 lb.
Water	720 lb.

Boil the above and while boiling add:

Potassium Chlorate	12 lb.
and then add:	
Sodium Carbonate in	115 lb.
Water	230 lb.

Various shades are obtained by varying composition of first solution, nature and amount of oxidizing agent and other reaction conditions.

Carmine Lake Pigment

Powder the best silver-gray cochineal as finely as possible, and boil it for three hours in water. Filter the hot solution quickly through a thick linen cloth. Boil up the filtrate again, and add the substances needed to form the lake. Many such substances may be used, but only two can be thoroughly depended upon, and they should both be used together. These two are alum and tin salt, and if necessary, warmth may be given to the color by the cautious addition, drop by drop, of hydrochloric acid. The alum must be absolutely free from iron, or it will be impossible to get more than a very unsatisfactory product. The best proportions are:

Cochineal	20 lb.
Water	500 lb.
Alum (Iron Free)	2 lb.
Tin Salt	2 lb.

The alum and tin salt are added at the boil, which is kept up till everything is dissolved. The clear solution is then exposed in shallow dishes covered with sheets of glass for several weeks in a very bright sunny place. By this time the dark-red liquor will have lost nearly all its color, and the carmine will have been deposited in the solid form, partly on the dish and partly on the surface of the liquid. It is separated by filtration, and carefully dried with blotting-paper. To get a fine and warm red it is absolutely indispensable that the dishes should get plenty of sun, so that the manufacture is impossible in any but the most favorable weather.

To get absolutely pure carmine, the product already described is dissolved in caustic ammonia. The solution is filtered, and the carmine is reprecipitated with acetic acid.

Satin White Pigment

Ninety pounds of quicklime are slaked in 27 gal. of boiling water. To this mixture 130 lb. of finely divided (260 mesh) aluminum sulphate are added quickly, and the mass is heated until it becomes almost solid. Thirty gallons of water are then added and the mixture agitated thoroughly. The last trace of any visible yellow color is neutralized by the addition of indanthrene blue in the form of a solution of 2.5 lb. of the commercial paste in 6 gal. of water. A very small amount of this solution is required if a good grade of lime and sulphate are used. The satin white is then filtered and dried.

Reflecting of Light by Colors

Color of Paint	Reflection Factor Per Cent
White (Gloss)	84
White (Flat)	82
White (Eggshell)	81
Ivory White	79
Cream	74
Aluminum (Made with Paste)	73
Ivory Tan	67
Light Green	62
Light Gray	59
Buff	55
Light Blue	52
Medium Green	49
Tan	48
Medium Blue	43
French Gray	32

Printing in Several Colors
British Patent 426,753

High-gloss color-printing is effected by printing the picture in black or other color in the usual way and over-printing the picture entirely or partly with a transparent colored gloss overprint varnish. The varnish may be colored with oil-soluble coloring matter or with highly glazing insoluble pigments or with both. In the last case, autotype prints having a double tone effect may be produced, the soluble color spreading out around each of the dots of the picture. The first print may be made with a normal black art printing ink. The varnish consists of clear resin ester 120, china wood oil 40, slightly boiled linseed oil 40, petroleum 6 and cobalt linoleate 6 parts. To 12 parts of varnish may be added 2 of rhodamine base in 2 of olein, 1 of Berlin blue or 1 of alizarin madder lake (I). Double tone effects may be produced by over-printing with a mixture of varnish 25, rhodamine base 0.5 in olein 0.5, and milori blue 1 parts, or with varnish 25, Sudan yellow 0.5 and (I) 1 part.

Dissolving Amber

The amber is powdered and heated under a reflux condenser with butyl alcohol containing a little hydrochloric acid for 6 to 8 hours.

Dustless Carbon Black
Formula No. 1

Carbon Black	200 g.
Sapropélite Tar	24 g.
Water	50 cc.

Form pellets or briquettes and dry at 105° C. for 3 hours.

No. 2

Carbon Black	200 g.
Dextrin Solution (5%)	100 cc.

Treat as above.

Colloidal Preservative
U. S. Patent 1,937,813

A transparent, solvent-resistant, antiseptic, colloidal mass is produced by condensing the gases evolved when gelatin 3 lb. or glue, etc., is heated with wood creosote 4 lb. at 160–250° C. for 2 hours.

Coloring Meerschaum Pipe Bowls

Beeswax	50 oz.
Olive Oil	50 oz.
Triethanolamine	15 oz.

The Meerschaum pipes are immersed in the above which is slowly heated to boiling and maintained at this temperature for 15 to 30 minutes. Pipes so treated will color very rapidly.

Blue Sheep Marking Pencil

Soapstone	28 lb.
Fine Gypsum	21 lb.
Chinese Blue	2 lb.
White Soap Powder	10 lb.

Mix all ingredients well together and make up with thin glue water into a stiff paste. They are then shaped like a thick pencil and dried.

Brewer's Glaze

Orange Shellac	25 oz.
Manila Copal	12 oz.
Acaroid Resin, Yellow or Red	8 oz.
Linoleic Acid	0.5 oz.
Alcohol	54.5 oz.

Rubbing Compound
(For Paint, Lacquers, etc.)

1.	Carnauba Wax	42 lb.
2.	Beeswax	18 lb.
3.	Ceresin	18 lb.
4.	Varnolene	3 gal.
5.	Water	3 gal.
6.	Triethanolamine	8 oz.
7.	Stearic Acid	2 lb.
8.	Tripoli	24 lb.
9.	Pumice	15 lb.

Melt 1, 2, 3, 7 with 4. Heat 5 and 6 to 90° C., add to wax mixture and stir till emulsified. Then add 8 and 9 and stir till cool.

Peeled Wood Wall Paper
U. S. Patent 1,945,686

The veneer is cut into strips of definite width which are dried, steeped in solution (1), dried, steeped in solution (2), dried, and finally backed with any kind of fibrous fabric. (1) comprises cellulose acetate 15, 14% solution of chrome alum 10, and water 70 oz., and (2) 25% glycerin 30, gelatin 25, and water 45 oz.

Double Strength Lead-Manganese Liquid Drier

Lead-Manganese Uversol No. 303	200 lb.
Bodied Linseed Oil	73.5 lb.
Pine Oil	9.0 lb.
Turpentine	60.0 lb.
Pine Tar Oil	3.0 lb.
Mineral Spirits	254.5 lb.

Yield 75 gal.

This drier is double the strength of the preceding, containing 1.0% manganese and 11.0% lead as metals.

Procedure: Melt the drier quickly with the linseed oil at a temperature not exceeding 275° or 300° F. Remove from fire and reduce with the solvents.

Lead-Manganese Drier

Lead-Manganese Uversol No. 303	100 lb.
Mineral Spirits	500 lb.

Yield 85 gal.

This drier has an acid value =0. It contains 0.5% manganese and 5.5% lead as metals. One part of drier to twenty parts of oil will give a metallic content of 0.025% manganese and 0.275% lead.

Pine Needle Bathing Salt

Formula No. 1

a. Salt	100	kg.
b. Water, Containing 5% Uranin (Fluorescein-Sodium)	2.5	kg.
c. Sodium Carbonate, Anhydrous	2.0	kg.
d. Magnesium Carbonate	0.2	kg.
e. Pine Needle Essence	2–3	kg.

Mix *a* with *b* homogeneously, dry on a shelf and sift through a sieve, mix then with *c* and *d,* in a drum, add *e,* mix again thoroughly, fill into sealed cans.

No. 2

Sodium Bicarbonate	10	g.
Starch Powder	1	g.
Tartaric Acid, Powdered	7.5	g.
Fluorescein or Uranin	0.1–0.2	g.

No. 3

Sodium Chloride	70	g.
Pine Needle Extract, Genuine	18	g.
Ammonium Carbonate	10	g.
Perfume (Pine-Needle)	2	g.

Ocean Bathing Salt

(1000 g. per Bath)

Potassium Iodide	1	g.
Potassium Bromide	0.55	g.
Lithium Carbonate	0.05	g.
Manganese Sulphate	0.01	g.
Ferrous Sulphate	0.01	g.
Potassium Chloride	15	g.
Calcium Chloride	40	g.
Magnesium Sulphate	66.38	g.
Magnesium Chloride	96	g.
Sodium Chloride	781	g.

Oxygen Bathing Salt

Formula No. 1

Ammonium Carbonate, Dried	500	g.
Hydrogen Peroxide (3%)	100	g.
Urea	5	g.

No. 2

Urea Hydrogen Peroxide	50–100	g.
Sodium Pyrophosphate	10	g.

No. 3 (Tablets)

Sodium Perborate	800	g.
Starch	100	g.
Ammonium Carbonate	100	g.

Medical Bathing Salts

Carlsbad Well

Sodium Sulphate	44	g.
Potassium Sulphate	2	g.
Sodium Chloride	18	g.
Sodium Bicarbonate	36	g.

Friedrichshall

Sodium Chloride	37.7	g.
Sodium Bromide	0.3	g.
Potassium Chloride	5	g.
Calcium Chloride	19	g.
Magnesium Chloride	37	g.
Calcium Sulphate, Precipitated	1	g.

Reichenhall

Potassium Chloride	6	g.
Magnesium Chloride	72	g.
Lithium Chloride	0.15	g.
Sodium Chloride	14	g.
Sodium Bromide	0.85	g.
Magnesium Sulphate	7	g.

Kreuznach

Sodium Chloride	63	g.
Potassium Chloride	75	g.
Calcium Chloride	750	g.
Magnesium Chloride	110	g.
Sodium Bromide	2	g.

Hallein Well

Sodium Chloride	69.3	g.
Magnesium Chloride	27	g.
Sodium Bromide	0.42	g.
Calcium Sulphate, Precipitated	10	g.
Sodium Sulphate	2.28	g.

Vichy

Lithium Carbonate	0.01	g.
Ferrous Sulphate	0.05	g.
Manganese Sulphate	0.01	g.
Sodium Chloride	1.73	g.
Sodium Sulphate	6.2	g.
Magnesium Sulphate	2.6	g.
Calcium Chloride	6.0	g.
Sodium Bicarbonate	83.4	g.

Mud Bath Salt

Ferrous Sulphate	900 g.
Calcium Sulphate, Precipitated	20 g.
Magnesium Sulphate	20 g.
Sodium Sulphate	40 g.
Ammonium Sulphate	20 g.

Optional, Dry Mud Earth.

"Saltrate Rodell"

Sodium Chloride, Powder	0.1 g.
Magnesium Carbonate	0.5 g.
Potassium Carbonate	0.1 g.
Lithium Carbonate	0.05 g.
Calcium Sulphate, Powder	0.25 g.
Borax, Powdered	10 g.
Sodium Bicarbonate	30.5 g.
Ammonium Carbonate	52.5 g.
Sodium Thiosulphate	2.5 g.
Sodium Perborate	3 g.

Stimulating Bathing Salt

Sodium Chloride, Powder	950 g.
Sodium Bicarbonate	50 g.
Thyme Oil	2 cc.
Bergamot Oil Terpenes	5 cc.
Orange Peel Terpenes	1 cc.
Bergamot Oil	1 cc.
Terpineol	1.5 cc.
Methyl Naphthyl Ketone	0.5 cc.

Effervescent Tablets for Baths

Formula No. 1

Sodium Bicarbonate	300 g.
Sodium Acid Sulphate	275 g.
Starch	25 g.

No. 2

Saponin, Purified	2 g.
Starch	25 g.
Sodium Bicarbonate	90 g.
Tartaric Acid	70 g.

The stability can be increased by pressing the bicarbonate and acid separately.

Effervescent Tablets with Wetting Agents

(*Slow* Development of Carbon Dioxide)

Formula No. 1

Starch	10 g.
Sodium Lauryl Sulphonate	10 g.
Sodium Bicarbonate	46 g.
Tartaric Acid	34 g.

No. 2

Sodium Bicarbonate	57 g.
Tartaric Acid	38 g.
Saponin, Purified	5 g.
Stearin, Powder	5 g.

Steel (Iron) Baths

Formula No. 1

Iron Tartrate	100 g.
Distilled Water	900 cc.

No. 2

Iron Sulphate, Pure	30–60 g.
Potassium Carbonate, Pure	120 g.

No. 3

Iron Sulphate	30 g.
Salt	60 g.
Sodium Bicarbonate	20 g.

Sulphur Baths

Formula No. 1

Potassium Sulphide	50 g.
Eau de Cologne	50 g.
Distilled Water	950 cc.

No. 2

Soft Soap	250 g.
Glycerin	50 g.
Potassium Sulphide	25 g.

No. 3

Sodium Thiosulphate plus Acid Bath-Water

No. 4

a.	Sulphur Sublimed	50–100 g.
	Ammonium Carbonate	950–900 g.
b.	Distilled Water, Warm	650 cc.
	Potassium Chromate, Neutral	25–50 g.

Mix *a*, dissolve *b*, mix both and stir several hours, until solid. Press and grind; 120 g. used for a bath.

No. 5

(Bain de la Parisienne)

Sodium Bicarbonate	870 g.
Magnesium Carbonate	10 g.
Sulphur Flowers, Ground	100 g.
Sulphur, Precipitated	20 g.
Selenic Acid	0.1 g.

Carbon Dioxide Baths

Formula No. 1

Ammonium Carbonate	35 g.
Sodium Bicarbonate	20 g.
Tartaric Acid	30 g.
Sodium Perborate	10 g.
Sodium Thiosulphate	3 g.
Disodium Phosphate	2 g.

No. 2

Sodium Bicarbonate	42 g.
Sodium Acid Sulphate	21 g.
Starch	5 g.
Sodium Chloride, Powder	30 g.

No. 3

Ammonium Carbonate	25 g.
Sodium Bicarbonate	20 g.

Tartaric Acid	25 g.
Sodium Perborate	10 g.
Rice Starch	20 g.
Manganese Nitrate	1/10 g.

Mix all components—except the perborate—dry and perfume, then add the perborate. Press in tablets.

Mud Bath

Ferrous Sulphate, Crude	900 g.
Epsom Salts	20 g.
Glauber's Salts	40 g.
Ammonium Sulphate	20 g.
Gypsum, Crude	20 g.
Clay, Dark	50 g.

Foot-Bath Powders (or Tablets) with Perborate

	Formula No. 1	Formula No. 2
Sodium Perborate	170 g.	180 g.
Boric Acid, Powder	70 g.	60 g.
Borax, Powder	50 g.	—
Sodium Acid Carbonate	250 g.	200 g.
Perfume	5–10 g.	—

Tablet or powder doses for each bath should weigh 10–20 g.

Cold Creams

Formula No. 1

Cetyl Alcohol	10 g.
Paraffin, Liquid	10 g.
Vaseline, White	80 g.
Water	60 g.

Transparent, soft, white cream.

No. 2

Cetyl Alcohol	10 g.
Paraffin, Liquid	40 g.
Vaseline, White	50 g.
Water	60 g.

No. 3

Cetyl Alcohol	10 g.
Paraffin, Liquid	40 g.
Vaseline, White	15 g.
Water	35 g.

No. 4

Cetyl Alcohol	20 g.
Paraffin, Liquid	20 g.
Vaseline, White	60 g.
Water	60 g.

In place of the liquid paraffin there can be used a good vegetable oil. The maximum water-content (37.5%) can be increased by adding 10% wool fat.

Procedure: Melt the fatty materials together and stir, then run in boiling water, a little at a time, not adding additional water until previous amount is absorbed.

No. 5

White Beeswax	12 g.
White Petroleum Jelly	12 g.
Peach Kernel Oil	50 g.
Rose Water	25 g.
Borax	1 g.
Perfume	to suit

Greaseless Cold Cream

Stearic Acid	16 oz.
Glycerin	48 oz.
Mineral Oil	12 oz.
Paraffin Wax	2 oz.
Stronger Ammonia Water	4 oz.
Water	64 oz.
Perfume	.75 oz.

Cold Cream

1. Diglycol Stearate	14 lb.
2. Paraffin Wax	2 lb.
3. Mineral Oil	3¾ gal.
4. Petrolatum (White)	6 lb.
5. Water	6 gal.
6. Perfume Oil	5½ fl. oz.

Method of manufacture:

a. Melt Nos. 1, 2, 3 and 4 at 170° F.
b. Heat 5 to 180° F.
c. Add *b* to *a* while mixing. Allow mixer to run until batch is completely emulsified.
d. Allow batch to cool to 125° F. and add 6 and mix at low speed.
e. Batch should be allowed to cool without stirring to 105° F. at which temperature it is poured into jars.

Glycerin Cold Cream

a. Wax, White	80 g.
Spermaceti	80 g.
Peanut Oil	300 g.
Vaseline	300 g.

Melt.

b. Glycerin	120 g.
Water	120 g.
Borax	10 g.

Warm up to 90°; pour into melted *a*.
Add when cool:

Perfume Composition, Fresh Odor	20 g.

Triethanolamine Cold Cream (Water-Soluble, Liquid)

a. Paraffin, Liquid	72 g.
Triethanolamine Stearate	14.5 g.

Dissolve, warming gently.

b. Water, Distilled	160 g.
c. Perfume	1.5 g.

When *a* is dissolved by warming, stir, and add *b* slowly. Let stand 24 hours, add perfume, then fill into containers.

Cleansing Cream
(Semi-Absorbent)

Lanolin	22 g.
White Mineral Oil	25 g.
White Petroleum Jelly	11 g.
Distilled Water	42 g.
Perfume	to suit

Cleansing Cream
(Non-Absorbent)

Ceresin	18 g.
White Mineral Oil	81 g.
White Petroleum Jelly	1 g.
Perfume	0.5 g.

Nourishing Cream

White Beeswax	9 g.
Spermaceti	3 g.
White Petroleum Jelly	35 g.
Benzoated Lard	18 g.
Lanolin	4 g.
Liquid Paraffin	9 g.
Distilled Water	21 g.
Borax	1 g.

Liquid Nourishing Cream

Lanolin, Anhydrous	16 g.
Stearic Acid	3 g.
Triethanolamine	1 g.
Water, Distilled	80 g.

Non-Irritating Creams
U. S. Patent 1,979,385

Formula No. 1
Vanishing Cream

Stearic Acid	220 g.
Lanolin (Anhydrous)	40 g.
Triethanolamine	12.5 g.
Diethylene Glycol Mono-ethyl Ether	75 g.
Water	500 g.

The cream is prepared by melting the acid and lanolin and adding them with constant stirring to the remaining ingredients, which are heated to 95° C. An emulsion forms at once which thickens upon cooling. Efficient agitation of the mixture is essential to obtain a smooth product. The solid content, i.e., in No. 1, the lanolin and stearic acid, of a cream of this type may vary from 15% to 35% depending upon the ingredients used and the type of product desired.

No. 2
Cleansing Cream

Stearic Acid	122.5 g.
Lanolin (Anhydrous)	35 g.
White Mineral Oil	210 g.
Triethanolamine	17.5 g.
Diethylene Glycol Mono-ethyl Ether	40 g.
Water	420 g.

The method of preparing this cream is the same as that employed in the previous formula. A cream of this type should have a fairly high content of the ethanolamine in order to completely emulsify the oil so that it may be removed from the skin by washing with water. Various oils and waxes may be used in this type of cream, and the oil content should be fairly high.

No. 3
After Shaving Cream

Stearic Acid	15 g.
Triethanolamine	0.75 g.
Diethylene Glycol Mono-ethyl Ether	8 g.
Menthol Crystals	0.75 g.
Ethyl Alcohol (Anhydrous)	0.5 g.
Water	75 g.

The cream is prepared according to the procedure given above. In general, creams of this type are similar to the vanishing creams with the addition of an emollient or a medicant, such as menthol, bay rum, witch hazel or the like.

No. 4
Latherless Shaving Cream

Stearic Acid	350 g.
Lanolin (Anhydrous)	67.5 g.
White Mineral Oil	169 g.
Triethanolamine	34 g.
Sodium Tetraborate	34 g.
Diethylene Glycol Mono-ethyl Ether	22.5 g.
Water	1170 g.

This preparation may be made by the procedure given in No. 1 and the oil may be included in the melted acid and wax mixture which is then added to the other ingredients.

Massage Cream

White Beeswax	12.5 g.
Paraffin Wax	10 g.
White Mineral Oil	50 g.
Distilled Water	26 g.
Borax	1 g.
Perfume	0.5 g.

Massage Preparations

These substances are dispensed in ointment, mixture or solution form, and ap-

plied before or after treatment, usually with a vibrator.

Formula No. 1

Menthol	2.5	g.
Tragacanth	4	g.
Glycerin	12	cc.
Alcohol	15	cc.
Water	300	cc.

No. 2

Gelatin	2	g.
Water	48	cc.
Glycerin	5	cc
Glycerite of Boroglycerin	45	g.

No. 3

Fluid Extract of Hamamelis	10	cc.
Wool Fat	60	g.
Petrolatum	30	g.

No. 4

Menthol	0.8	g.
Camphor	0.8	g.
Eucalyptol	3	g.
Petrolatum	96	g.

Almond Hand-Cleansing Paste

The "Almond Bran" is made out of two equal parts of sweet and bitter Almonds. One can make a "Glycerin Paste" or a "Camphor Paste."

Glycerin Type

Two hundred fifty pounds of the bran are pounded with 5 lb. of rose water and mixed with the following:

One-quarter pound bean or cornflour, 1–2 chicken eggs, 15 lb. borax, 5 lb. fine potassium carbonate, and about 50 lb. glycerin.

The Camphor Paste is made by adding to the pounded "Almond Bran" a mixture of 25 lb. each of 10% camphor oil and spermaceti, molten together.

After cooling, add a powderized mixture of 100 lb. potato flour and 50 lb. talc, and 100 lb. rose water. Mix well altogether. Color with alkannin or curcuma.

Glycerin Jelly for the Hands

a.	Wheat Starch } grind	10	g.
	Water } grind	15	g.
	Glycerin	100	g.
b.	Tragacanth, White	2	g.
	Alcohol (90%)	5	g.
	Methyl-*p*-Hydroxybenzoate	0.5	g.

Grind *a* and *b* separately, mix, warm then on the water bath until odor of alcohol disappears.

Glycerin-Honey Jelly

Honey	20	g.
Water	500	g.
Glycerin	450	g.
Agar-Agar, Cut	15	g.
Methyl-*p*-Hydroxybenzoate	1	g.

Warm to complete swelling and solution percolate, if necessary. Stir, and add:

Formaldehyde (40%)	1	g.
Perfume Composition	1	g.

Protective Hand Creams

Formula No. 1

Zinc Stearate, U.S.P.	10	g.
Aluminum Subacetate Solution N.F. (7½–8%)	15	g.
Gum Camphor	3	g.
Menthol Crystals	1	g.
Acid Carbolic, U.S.P.	½	g.
Glycerin, U.S.P.	½	g.
Lanolin, Anhydrous	½	g.
Gum Tragacanth	4½	g.
Soap (Low Alkali Content)	18	g.
White Rose Oil Technical	½	g.
Triethanolamine	½	g.
Water	46	g.

No. 2

Zinc Stearate, U.S.P.	10	g.
Aluminum Subacetate Solution N.F. (7½–8%)	15	g.
Gum Camphor	3	g.
Menthol Crystals	1	g.
Acid Carbolic, U.S.P.	½	g.
Glycerin, U.S.P.	½	g.
Lanolin (Anhydrous)	½	g.
Gum Tragacanth	4½	g.
Soap (Low Alkali Content)	18	g.
White Rose Oil Technical	½	g.
Triethanolamine	½	g.
Water	44¼	g.
Sulpho Ammonium Ichthyolate	2	g.

No. 3

White Rose Technical Oil	35	g.
Paraffin Wax	55	g.
Ammonium Sulpho-Ichthyolate	2	g.
Stearic Acid	1	g.
Triethanolamine	½	g.
Water	7½	g.

No. 4

Glyceryl Monostearate	8	lb.
Magnesium Stearate	14	lb.
Beeswax	3	lb.
Petrolatum	10	lb.
Mineral Oil, White	5	lb.
Water	60	lb.

Cuticle Softener

Formula No. 1

White Petrolatum (Short Fiber)	87.75 oz.
Paraffin (m.-p. 125° F.)	9 oz.
Menthol	3 oz.
Thymol	.25 oz.
Color (Oil Soluble Red)	to suit

No. 2

Lanolin (Anhydrous)	12 oz.
Water (Distilled)	12 oz.
Lecithin	0.5 oz.
Cream Petrolatum (Short Fiber)	55.5 oz.
Mineral Oil (White)	20 oz.
Perfume	to suit

Skin Cream

a. Stearin	85 g.
Lanolin	5 g.
Cetyl Alcohol	10 g.
Melt together.	
b. Glycerin (28° Bé.)	36 g.
Triethanolamine	5 cc.
Borax	knifepointful
Water	250 cc.
Boil.	

Add *b* slowly to *a*, stir until cold. Perfume as desired is added at the end.

"Penetran" Skin Cosmetic

Paraffin Oil	20 cc.
Sperm (Whale) Oil	25 cc.
Parachol (Absorption Base)	5 g.
Cholesterin	0.5 g.
Lecithin	2.5 g.
Fatty Oil, Preserved	47 cc.

Wrinkle "Removing" Creams

Lanolin anhydrous 20 (parts by weight), cocoa butter 10, stearin 10, olive oil 12, cholesterol 2, lecithin 4, water 60, moldex 0.4, sodium benzoate 1. According to another method, a melted base is first prepared with white wax 60 (grams), spermaceti 10, stearin 50, lanolin 60, cocoa butter 40, and sweet almond oil 180. In this melt are dissolved 1.2 grams cholesterol, with further addition, after complete solution, of 170 g. water, 1.5 g. sodium benzoate and moldex, the mass being stirred until it thickens.

Skin "Food"

Formula No. 1

Lanolin (Anhydrous) U.S.P.	36.4 g.
Spermaceti, U.S.P.	6.4 g.
Snow White Petrolatum, U.S.P.	48.2 g.
Distilled Water	7.875 g.
Perfume Oil	1.125 g.

No. 2

Almond Oil	24 g.
Lanolin	22 g.
Soft Paraffin	11 g.
White Beeswax	3 g.
Rose Water	40 g.
Perfume	to suit

Mosquito Repelling Cream

Formula No. 1

a. Wheat Starch	5 g.
a. Water	10 g.
b. Glycerin (28° Bé.)	45 g.
c. Lanolin	30 g.
d. Clove Oil	5–10 g.

Grind *a* until homogeneous, add *b*, and warm gently until a homogeneous jelly is formed. Cool, and grind now with *c* and *d* in a mortar very thoroughly until distribution is satisfactory. Fill at once into collapsible tubes.

No. 2

a. White Wax	50 g.
a. Spermaceti	50 g.
b. Borax	4 g.
b. Ammonia (0.96)	40 g.
c. Water	510 cc.
c. Wheat Starch	1 g.
c. Gelatin	4 g.
c. Sodium Benzoate	0.5 g.

Make up cream as usual pouring *b* into *a*, then add the solution *c* which is to be made up before (soak cold, then warm to clear solution, if necessary, pour through a fine sieve), stir thoroughly, stop heating, stir until cooled, and add

Eucalyptus Oil	50 cc.

No. 3

Eucalyptus Oil	0.5 cc.
Caryophyllum Oil	0.5 cc.
Lavender Oil	0.5 cc.
Quinine Sulphate	1 g.
Glycerin Salve	to make 100 g.

No. 4

Tragacanth	3 g.
Alcohol	5 g.
Soap Solution	2.5–25 g.
Glycerin	45 g.

To this cream add:

Menthol	1 g.
Sodium Benzoate	1 g.
Citronella Oil	1 cc.
Caryophyllum Oil	0.5 cc.
Alcohol	10 cc.
Tincture of Green Soap	10 cc.

Mosquito Repellants

Formula No. 1

Pyrethrum Flowers	10 g.
Isopropyl Alcohol, or Ethanol with Thymol	100 g.
Oil of Cloves	2 g.

No. 2

Oil of Eucalyptus	45 g.
Oil of Thuia	20 g.
Oil of Laurel	5 g.
Phenol	3 g.
Camphor	20 g.
Alcohol	100 g.
Turpentine Oil	50 g.
Quassia, Tincture	40 g.
Pyrethrum Extract	50 g.
Xylol	to make 1000 cc.

No. 3

Pyrethrum Extract	0.5 g.
Amyl Salicylate	3.5 g.
Petroleum (b.-p. 182–292°; sp. gr. 0.801)	96 g.

No. 4

Pyrethrum Powder	1 g.
Derris-Root Powder	1 g.
Tobacco Powder	0.5 g.
Alcohol, Diluted	25 g.

Percolate thoroughly and filter; add: oil of eucalyptus or menthol to suit.

Mosquito Protection Cream (Non-Greasy)

Formula No. 1

Soak

a.	Agar-Agar	2 g.
	Water, Cold	400 g.

Then warm slowly over gentle heat:

b.	Melt Stearin	60 g.
c.	Alcohol (95%)	10 g.
d.	Potassium Carbonate	6 g.
	Water	440 g.
	Glycerin (28° Bé.)	68 g.

Make up emulsion by warming and stirring.

Add *a* to the emulsion of *b*-*c* in *d*, both should be 80° C.; stir continously. When cold, add 12 g. of the following mixture:

Cedar Oil	7.5 g.
Citronella Oil	15 g.
Camphor	2 g.
Eucalyptus Oil	4.5 g.
Alcohol	7 g.

No. 2

Treatment as above:

Agar-Agar	2.2 g.
Stearin	60 g.
Potassium Carbonate	4 g.
Sal Soda	2 g.
Alcohol	12 g.
Beeswax, White	8 g.
Lanolin (Anhydrous)	8 g.
Glycerin	60 g.
Water	830 g.
Beta Naphthol	1 g.
Essential Oils as in Formula No. 1	

Treatment as in No. 1, saponify the fats (wax, lanolin, stearin) together.

No. 3

a.	Agar-Agar	2.5 g.
	Glycerin	100 g.
	Water	750 g.
b.	Glyceryl Monostearate	120 g.
	Spermaceti	100 g.
	Melt.	

Pour *a* hot into *b*, make emulsion, stir. Add boiling water up to 980 g. Add, when cold:

Moldex or Other Good Preservative	2 g.
Essential Oils	12 g.

(See Formula No. 1)

All Weather Cream

a.	Stearic Acid	210 g.
	Adeps Lanae, Anhydrous	50 g.
b.	Glycerin	133 g.
	Triethanolamine	20 g.
	Borax	5 g.
	Distilled Water	582 cc.

Melt up *a* to about 65° C., add *b* boiling hot, in thin jet, stirring thoroughly until cold.

Night Cream (Greasy)

a.	Paraffin Oil, White	2500 g.
	Wax, Scale	500 g.
	Beeswax, Bleached	500 g.
	Adeps Lanae, Anhydrous	500 g.
b.	Distilled Water	3000 cc.
	Triethanolamine	75 g.
	Borax	35 g.

Melt *a* together at 75° C.; add *b* which is at same temperature, to *a*. Stir until cold.

Non-Greasy Cream

Formula No. 1

a.	Stearic Acid	230 g.
	Wax, Scale	40 g.
	Adeps Lanae, Anhydrous	10 g.
b.	Glycerin	140 g.
	Triethanolamine	13 g.
	Borax	5 g.
	Distilled Water	562 cc.

Melt *a* and warm up *b* in another container. Mix both (*a* and *b* should be 65°

C. boiling) pouring *b* into *a* in thin jet. Stir until cold.

No. 2

a.	Stearic Acid	170	g.
	Adeps Lanae, Anhydrous	13	g.
	Wax, Scale	13	g.
	Spermaceti	5	g.
	Cetyl Alcohol	4	g.
b.	Glycerin (28° Bé.)	80	g.
	Triethanolamine	13	g.
	Borax	5	g.
	Distilled Water	697	cc.

Melt up waxes (65–70°), add *b* hot (boils) in thin jet, stirring thoroughly. Optionally, 100 water may be substituted by witch hazel (1 : 1). Stir until cold.

Liquid Cream

a.	Stearic Acid	50	g.
	Adeps Lanae, Anhydrous	4	g.
	Cetyl Alcohol	1	g.
	Beeswax	1	g.
b.	Glycerin	20	g.
	Triethanolamine	2	g.
	Borax	2	g.
	Witch Hazel (1 : 1)	75	g.
	Distilled Water	625	cc.

Melt up together *a* at 60–70° C. Heat *b* to boiling, then add in thin jet, stirring vigorously, to *a*. Stir until cold.

To all above-mentioned creams, perfume should be added during cooling (0.5–0.7%). The perfume components should be colorless, and should not irritate the skin. No alcoholic compositions should be used.

Turtle Oil Cream

1.	Diglycol Stearate	14	lb.
2.	Mineral Oil	3¾	gal.
3.	Lanolin	6	lb.
4.	Petrolatum (White)	2	lb.
5.	Water	6	gal.
6.	Turtle Oil	5½	fl. oz.
7.	Perfume Oil	5½	fl. oz.
8.	Solution Yellow Color Made by Dissolving Yellow Dye 2 drams in Mineral Oil 14 fl. oz.	8¼	fl. oz.

Method of manufacture:

a. Melt 1, 2, 3, 4, 6 and 8 at 170° F.
b. Heat 5 to 180° F.
c. Add *b* to *a* while mixing. Allow mixer to run until batch is completely emulsified.
d. Allow batch to cool to 125° F. and add 7, and mix at low speed.
e. Batch should be allowed to cool without stirring to 100° F. at which temperature it is poured.

Boro-Glycerin Lanolin Cream

a.	Boric Acid	10	g.
	Glycerin	40	g.
	Water	250	g.

Dissolve.

b.	Lanolin, Anhydrous	100	g.
	Vaseline, White	600	g.

Melt gently.

c.	Rose Oil, Artificial	10	cc.
	or Eau de Cologne Oil	20	cc.

Tragacanth-Glycerin Base (Used Below)

Tragacanth, White, Fine Powder	1 g.
Glycerin	5 g.

Grind thoroughly in mortar and add:

Water, Warm	94 g.

Add while stirring and in small portions, warm up to 40° C. Stir until paste is homogeneous.

Menthol Cream

Menthol	0.2 g.
Moldex or Other Good Preservative	0.2 g.
Perfume Oil	0.3 g.
Alcohol (95%)	5 g.

Dissolve and add

Glycerin	5 g.

Add above made

Tragacanth-Glycerin	100 g.

Lemon Juice Cream

U. S. Patent 1,990,676

Five parts of oxy-cholesterin and 95 parts of petrolatum are thoroughly mixed to form an absorption base. Twenty parts of petrolatum and three parts of beeswax are melted together, and 30 parts of the base are added with thorough stirring. Fifty parts of natural lemon juice are added to the above mixture while still hot and stirring is continued until the mass is cool.

Ink Removing Cream

U. S. Patent 1,968,304

A substantially non-aqueous cream for the removal of ink stains from the skin contains about 500 g. of zinc stearate, about 300 g. of citric acid, about 500 cc. of 95 per cent ethyl alcohol and about 2000 cc. of diethylene glycol.

Deodorant Cream

Formula No. 1

Benzoic Acid	4 g.
Zinc Oxide	12 g.
Lanolin	4 g.
Petrolatum (Snow White)	80 g.
Perfume	to suit

No. 2

British Patent 425,059

Coconut Oil	63 g.
Lemon Oil	5.2 g.
Boric Acid, Powdered	21 g.
Starch, Powdered	10.5 g.
Lanolin	0.2 g.
Perfume	0.1 g.

No. 3

Formaldehyde	1 oz.
Vanishing Cream	99 oz.

Powder Cream Base

Using specified quantities, preparation of the cream base may proceed on the following lines: A mixture of about 500 g. distilled water, 20 g. potassium carbonate and 125 g. glycerin is heated almost to boiling point in a capacious vessel constructed of well enamelled material. Two hundred grams stearic acid melted in another vessel are cautiously introduced, a little at a time, into the hot potassium carbonate solution. Violent carbon dioxide evolution ensues and continues until the last portion of stearic acid has been added. When gas development ceases, indicating completion of the reaction, heating is discontinued and the batch transferred to another vessel fitted with stirring gear. An additional 1000 g. water and 125 g. glycerin are added and the mix stirred until cold and viscous. Cold-stirring is important for securing a fine, uniform emulsion and for preventing settlement of stearic acid particles. Certain variations in preparation can be practiced, such as replacement of glycerin by white liquid paraffin or addition of 125 g. groundnut oil to facilitate emulsification.

Ruggles' Cream

Powdered Stearic Acid	75 g.
Potassium Carbonate	15 g.
Distilled Water	320 g.
Powdered Borax	5 g.
Quince Jelly	75 g.
Distilled Water	100 g.
Powdered Zinc Oxide	10 g.
Glycerite Starch	400 g.

Melt the stearic acid. At the same time dissolve the potassium carbonate in 320 cc. of distilled water and heat to about 170° F. on water bath. Bring stearic acid to the same temperature and mix them. Continue this temperature on the water bath, with occasional stirring, until the reaction is perfectly complete.

Dissolve the powdered borax in 100 cc. of distilled water, add the quince jelly and heat on water bath to about 170° F. Add this mixture to the first, which should be at the same temperature, and again leave on water bath until reaction is complete.

Heat the glycerite of starch to the same temperature, stir in the powdered zinc oxide with a glass stirring rod and add to the other mixture, stirring occasionally.

Let cool and add perfume (oil ylang ylang recommended).

The most important essential is to employ a perfect glycerite of starch. Use Kingsford's or other suitable grade of corn starch and U. S. P. Glycerin and make it up fresh for each batch.

It is also essential to have all three batches at exactly the same temperature when mixing them.

Skin Oil with Isocholesterin

Paraffin Oil plus Preserved Fatty Oil	97 cc.
Isocholesterin, Technically Pure	3 g.
or Same, Chemically Pure	2 g.

Skin Oil with Lanolin

Lanolin, Bleached	5 g.
Paraffin Oil or Fatty Oils	95 cc.

Skin Oil with Wool Wax

Wool Wax, Bleached, Purified	5 g.
Fatty Oil	35 cc.
Paraffin Oil	60 cc.

Skin Oil with Cetyl Alcohol

Cetyl Alcohol, Pure	3–5 g.
Paraffin Oil plus Fatty Oil, Preserved (1 : 1)	97–95 cc.

Skin Oil with Triethanolamine Oleate

Triethanolamine Oleate, Pure	2 g.
Fatty Oil	98 cc.

Non-Irritating Skin Oil

Diglycol Laurate Neutral	4 g.
Olive Oil	96 cc.
Perfume	to suit

Lecithin Skin Oil

Formula No. 1

Lecithin from Eggs	10–30	g.
Paraffin Oil	170–190	cc.
Olive Oil, Preserved	800	cc.
Perfume, to suit	5	g.

No. 2

Lecithin from Brain Substance	20	g.
Paraffin Oil	180	cc.
Olive or Peanut Oil, Preserved	800	cc.

Skin Oil "Huile Ambrosiaque"

Ambergris, Best Quality	10	g.
Behen Oil	990	cc.
Perfume	to suit	

Grind the amber with glass-powder and introduce into the warmed oil. Shake well. Filter after 3–4 weeks.

Skin Oil with Wool Fat Alcohols

Parachol (Absorption Base)	5–10	g.
Paraffin Oil	95–90	cc.

Skin Cleansing Oil

Parachol or Absorption Base	2	g.
Triethanolamine Oleate, Pure	0.5	g.
Fatty Oil, Preserved	97.5	cc.

Add a little Triethanolamine.

Skin Nourishing Oil

Egg Oil	5	g.
Parachol (Absorption Base)	5	g.
Lecithin	1	g.
Sperm (Whale) Oil, Genuine, Deodorized	20	cc.
Fatty Oil, Preserved	69	cc.

Skin "Stimulating" Oils

Formula No. 1

Parachol (Absorption Base)	5	g.
Oxycholesterin, Artificial	3	g.
Fatty Oil (Olive, Sesame, Peanut), Preserved	92	cc.

No. 2

Parachol (Absorption Base)	5	g.
Cetyl Alcohol, Pure	3	g.
Fatty Oil, Preserved	91	cc.

Astringent Skin Oil

Aluminum Stearate	3	g.
Fatty Oil	97	cc.

Witch Hazel Skin Oil

Witch Hazel Leaves, Powder	100	g.
Fatty Oil, Preserved	900	cc.

Pour hot oil over leaves, let stand for 8 days. Filter.

Massage Oil

Paraffin Oil	75	cc.
Parachol (Absorption Base)	5	g.
Olive Oil, Preserved	20	cc.

Muscle Oil

Castor Oil, Deodorized	66.6	cc.
Alcohol (92–95%)	33.3	cc.
Cholesterin, Pure	0.1	g.

Sport Oil (for Swimmers)

Octadecyl Alcohol (Pure)	5	g.
Fatty Oil, Preserved	55	cc.
Paraffin Oil	40	cc.

Cholesterin Oil

Fatty Oil, Pure, or in Mixture with Paraffin Oil	1000	cc.
Cholesterin, C.P.	5–10	g.

Cholesterin-Lecithin Oil

Same as Cholesterin Oil, but besides add Lecithin (Eggs, Brain-Substance) 20–30 g.

Face Lotions

Formula No. 1

Triethanolamine	0.5	cc.
Glycerin	4	cc.
Alcohol	33	cc.
Distilled Water	62	cc.
Perfume	0.5–1	cc.

No. 2

Triethanolamine	0.5	cc.
Glycerin	4	cc.
Alcohol (30%)	95.5	cc.
Perfume	to suit	

No. 3

Orange Flower Water	800	cc.
Eau de Cologne	200	cc.
Triethanolamine	6	cc.
Spirits of Camphor	20	cc.
Glycerin	100	cc.

No. 4

Camphor	20	cc.
Alcohol (96%)	850	cc.
Glycerin (28° Bé.)	50	cc.
Perfume	30	cc.
Distilled Water	1500	cc.
Triethanolamine	15	cc.

No. 5

Triethanolamine	5 cc.
Alcohol (96%)	500 cc.
Spirits of Camphor	100 cc.
Perfume	10 cc.
Glycerin	20 cc.
Witch Hazel, Distilled	1000 cc.

For Dry Skin: No. 6

Mineral Oil, White	35 cc.
Beeswax	20 g.
Amino Stearin	8 g.
Water	50 cc.

Warm together and mix vigorously until emulsified.

No. 7

Vaseline Oil	72 cc.
Amino Stearin	14 g.
Water	200 cc.

No. 8

Triethanolamine	5 cc.
Aromatic Spirit	30 cc.
Bergamot Oil	12.5 cc.
Oil Orange Flowers	0.5 cc.
Lemon Oil	2 cc.
Rosemary Oil	15 cc.
Alcohol (70%)	940 cc.

No. 9

Camphor	25 g.
Alcohol	850 cc.
Glycerin	25 cc.
Perfume Mixture	30 cc.
Distilled Water	1570 cc.

No. 10

Boric Acid	10 g.
Glycerin	29 cc.
Menthol	1 g.
Perfume	5 cc.
Alcohol	255 cc.
Hamamelis Distillate	300 cc.
Rose Water	400 cc.

No. 11

Alcohol	450 cc.
Camphor, Spirits of	100 cc.
Perfume	10 cc.
Hamamelis Distillate	440 cc.

No. 12

Potassium Carbonate	400 g.
Distilled Water	2000 cc.
Orange Flower Water	1000 cc.
Alcohol	100 cc.
Perfume	to suit

No. 13

Borax	50 g.
Sodium Thiosulphate	500 g.
Distilled Water	8500 cc.
Glycerin	500 cc.
Eau de Cologne	500 cc.

Face Lotion (For Dry Skin)

Lanolin or Cholesterol	0.05 g.
Lecithin	0.05 g.
Alcohol	6 g.
Glycerin, C.P.	3 g.
Almond Oil	10 g.
Distilled Water	about 85 g.

Face Lotion (For Oily Skin)

Sulphur, Precipitated	2 g.
Glycerin, C.P.	5 g.
Camphor Spirit (10%)	3 g.
Lavender Water	10 g.
Borax	1 g.
Distilled Water	81 g.

Acne Face Lotion

Formula No. 1

Acetic Acid (96%) or Benzoic Acid	5 g.
Alcohol (95%)	500 g.
Lavender Oil	4 g.
Water	466 g.
Glycerin (28° Bé.)	25 g.

Let stand several weeks. Filter.

No. 2

Potassium Soap from Olive Oil (Neutralized)	100 g.
Alcohol (90%)	500 g.
Lavender Oil	5 g.
Rose Oil, Artificial	5 g.
Water	390 g.

Face Water

Triethanolamine	0.5 g.
Glycerin	4 g.
Alcohol	33 g.
Perfume	0.5 g.
Distilled Water	62 g.

Prophylactic Face Waters

Formula No. 1

Ammonium Chloride, C.P.	0.5 g.
Witch Hazel	20 cc.
Rose Water	10 cc.
Distilled Water	69.5 cc.

No. 2

Ammonium Chloride	2.5 g.
Cherry Laurel Water	10 cc.
Witch Hazel	10 cc.
Rose Water	20 cc.
Distilled Water	57 cc.
Diethylene Glycol	0.5 cc.

Kummerfeld's (Face) Water

Sulphur, Colloidal, or Finely Precipitated	2 g.
Glycerin	12 cc.
Spirits of Camphor	4 cc.
Eau de Cologne	20 cc.
Distilled Water	100 cc.

Optionally: Addition of Borax, or Pot-

ash, or Triethanolamine (intensifies effect).

Sulphur Face Water

Sulphur, Colloidal	3 g.
Potassium Carbonate	1.5 g.
Glycerin	5 cc.
Spirits of Camphor	4 cc.
Alcohol	10 cc.
Distilled Water	76.5 cc.

Skin Lotion

Gum Tragacanth	4 oz.
Glycerin	3 oz.
Phenol	1 oz.
Oil of Teel	120 oz.
Water	360 oz.
Perfume	2 oz.

Modern Glycerin-Sulphur Lotion

Colloidal Sulphur in Glycerin (24%)	100 g.
Tincture of Green Soap	100 g.
Eau de Cologne—Oil	1 g.
Water, Distilled	799 g.

Glycerin and Cucumber Lotion

	Cucumber Perfume	5 g.
b.	Alcohol (95%)	50 g.
	Benzoic Acid	0.3 g.
	Cucumber Perfume	5 g.
c.	Tragacanth, Fine, White	5 g.
	Glycerin	100 g.

Grind *c* together, then add *a* and *b* in small portions, grinding to get homogeneous paste.

Cucumber and Egg Lotion

Cucumber Juice	400 g.
Alcohol	50 g.
Benzoic Acid	0.25 g.
Egg Yellow	1–2 g.
Lavender Oil	3 g.
Rose Oil, Artificial	1 g.
Glycerin	100 g.

Face Water, Acid

Alcohol (45%)	900 cc.
Tri- (or Di-) Ethylene Glycol	30 g.
Citric Acid	5 g.
Glycerin	30 g.
Witch Hazel	35 cc.

Face Water, Astringent

Alcohol (35%)	950 cc.
Diethylene Glycol	30 g.
Glycerin	15 g.
Tannic Acid, Pure	3 g.
Phosphoric Acid, C.P.	2 g.

Skin Hardener

Alum	30 g.
Water and Alcohol (Equal Parts)	250 cc.

Strong Astringent Lotion

Salicylic Acid	3¼ lb.
Benzyl Cinnamate	2½ oz.
Acetone	1 gal.
Alcohol	1 gal.

The quantity of salicylic acid may be reduced ½ if a milder agent is desired.

Face Water with Witch Hazel

Alcohol (40%)	920 g.
Witch Hazel	50 cc.
Glycerin, C.P.	30 g.

Modern Neutral Face Water

Alcohol (40%)	920 cc.
Diethylene Glycol	30 g.
Glycerin, C.P.	50 g.

Face Water for Mottled Skin or Freckles

Zinc Sulphate, C.P.	1 g.
Citric Acid, C.P.	0.5 g.
Hydrogen Peroxide (3–10%)	89.5 cc.

Freckle Lotion

Dissolve:

Potassium Carbonate	60 g.
Potassium Chlorate	20 g.
Borax	15 g.
Sugar	60 g.

In:

Rose Water	330 g.
Orange Flower Water	355 cc.
Glycerin	150 cc.

Skin Cleansing Lotion

British Patent 423,426

Sodium Biborate	1.33 g.
Potassium Alum	2.30 g.
Soda Ash	1.75 g.
Water	100 cc.

Evaporate down to half of volume.

Liquid Deep Pore Cleanser

Witch Hazel Extract, U.S.P.	50 oz.
Alcohol	28 oz.
Polyalkyl-glycol Ether (Glycopon S)	15 oz.

Face Pack

Put on face for 20 min. a mixture of

Oat Flour	20 g.
Arnica Flowers	2 g.

Chamomile Flowers	2 g.
Hamamelis Leaves	2 g.
Rosemary Leaves	2 g.
Camphor Water	30 cc.

Treat afterwards with astringent lotion of

Tannic Acid	0.25 g.
Rose Water	25 g.
Hamamelis Water	50 g.
Orange Flower Water	25 g.

Hand Lotion

Formula No. 1

Alcohol, Ethyl	600 cc.
Glycerol	100 cc.
Menthol	5 g.
Perfume, Rose Oil, Etc.	1 cc.
Salicylic Acid	2 g.
Water	300 cc.

No. 2

Alcohol, Ethyl	550 cc.
Glycerol	175 cc.
Menthol	3 g.
Perfume, as desired, about	1 cc.
Salicylic Acid	2 g.
Water	275 cc.

No. 3

Alcohol, Ethyl	500 cc.
Glycerol	250 cc.
Menthol	1 g.
Perfume, as desired, about	1 cc.
Salicylic Acid	2 g.
Water	250 cc.

A lavender coloration of varying intensity may be obtained by adding traces of ferric chloride solution. Formula No. 3 gives a rather oily lotion.

Low Cost Almond Lotion

1. Diglycol Stearate	7	lb.
2. Water	30	gal.
3. Gum Tragacanth Solution	6	gal.
4. Benzaldehyde	3	fl. oz.
5. Oil of Bergamot	1½	fl. oz.

Method of manufacture:

a. Melt No. 1 at 160° F.
b. Heat No. 2 to 205° F. and run into stone jar (note final temperature of water after dumping into jar must not be below 170° F.).
c. With high speed agitator running, add *a* (molten at 160° F.) to *b*, at at least 170° F. and allow mixer to run until temperature has dropped to 140° F.
d. Add 3 to batch while mixture is still running.
e. Add 4 and 5 immediately after 3 and allow mixer to continue running until temperature has dropped to 90° or 95° F.

The gum solution is made as follows:

Gum Tragacanth	2½ lb.
Water	50 gal.

Allow the gum to soak for several hours and beat into solution.

Rose Lotion

1. Diglycol Stearate	7	lb.
2. Water	30	gal.
3. Gum Solution	6	gal.
4. Oil of Rose	3	fl. oz.
5. Red Color Solution Made by Dissolving Red Dye, 1 oz., in Water, 1 qt.	¾	fl. oz.

Method of manufacture:

a. Melt No. 1 at 160° F.
b. Heat No. 2 to 200° F. and run into stone jar (note: final temperature of water after dumping into jar must not be below 170° F.).
c. With high speed agitator running add *a* (molten at 160° F.) to *b* at at least 170° F. and allow mixer to run until temperature has dropped to 140° F.
d. Add 3 to batch while mixer is still running.
e. Add 4 and 5 immediately after 3 and allow mixer to continue running until temperature has dropped to 90° or 95° F.

The gum solution is made as explained under almond lotion.

Lemon Lotion

1. Diglycol Stearate	7	lb.
2. Water	30	gal.
3. Gum Solution	6	gal.
4. Oil of Lemon	1½	fl. oz.
5. Yellow Dye	¾	oz.

Method of manufacture:

a. Melt No. 1 at 160° F.
b. Heat No. 2 to 200° F. and run into stone jar (note: final temperature of water after dumping into jar must not be below 170° F.).
c. With high speed agitator running add *a* (molten at 160° F.) to *b* at at least 180° F. and allow mixer to run until temperature has dropped to 145° F.
d. Add 3 to batch while mixer is still running.
e. Add 4 and 5 immediately after 3 and allow mixer to continue running until temperature has dropped to 95° or 100° F.

The gum solution is made as explained under almond lotion.

Milky Lotion with Pectin

Base Emulsion (See Below)	550 g.
Distilled Water	445 g.
Perfume	5 g.

Base Emulsion

Distilled Water	710 g.
Mineral Oil	180 g.
Dried Pectin	50 g.
Citric Acid	10 g.
Extract Chamomile Flowers	50 g.

Moisten the pectin with a little alcohol and then rub with a little water in which the citric acid is dissolved until a fine mucilage is obtained. The pectin swells to a large extent. In the rest of the water dissolve the liquid chamomile extract and the warm solution a little at a time to the pectin mucilage. When all the water has been added, heat until a uniform solution results, avoiding overheating. The oil is then emulsified with this solution, preferably in a colloid mill or a homogenizer.

Bathing Milk

Emulsion of:

Turkey Red Oil Neutralized with Caustic Potash	200 g.
Perfume Mixture	350 g.

Add then:

Potassium Carbonate Solution (20° Bé.)	50 g.
Clear Liquid Soap (10%)	400 g.

A higher content of etheric oils necessitates more turkey red oil and potash, and eventually terpineol.

For a thicker balm: Use only 100 g. Turkey Red, but add 100–150 g. oleic acid, and saponify the whole with caustic.

The milky character is bettered by addition of potassium stearate, triethanolamine stearate (or oleate).

Benzoin Milk

Mix in a mortar or dish:

a.	Tincture of Benzoin	50 cc.
	Alcohol (95%)	200 cc.
b.	Glycerin	100 cc.
c.	Water, Distilled	700 cc.

First grind *a*, add *b*, and pour slowly under stirring *c* into *a* and *b*. Let stand a week. Filter. Shake before use.

Glycerin Toilette Water

a.	Alcohol (95%)	50 g.
	Rose Essence	0.4 g.
b.	Glycerin	50 g.
c.	Borax dissolved in	20 g.
	Water, Warm	880 g.

Add *c* cold to *a* and *b*.

Dusty Odor Face Lotions

Formula No. 1

Glycerin	1 cc.
Lactic Acid	0.2 cc.
Menthol	0.5 g.
Opoponax—Perfumes with Violet Root Oil, etc.	0.5 cc.
Alum	0.3 g.
Alcohol (35%)	97.5 cc.

No. 2

Glycerin	1 cc.
Citric Acid	0.2 g.
Aluminum Acetate	0.3 g.
Menthol	0.5 g.
Hamamelis Water	5 cc.
Perfumes (as above)	0.5 cc.
Alcohol (40%)	92.5 cc.

No. 3

Glycerin	1 cc.
Alum	1 g.
Zinc Sulphophenylate	0.5 g.
Perfumes (as above)	0.5 cc.
Menthol	0.5 g.
Isopropyl Alcohol	10 cc.
Rose Water	10 cc.
Alcohol (30%)	76.5 cc.

Eau de Quinine

Alcohol	600 g.
Water	400 g.
Quinine Sulphate	5 g.
Saponine	1 g.
Saffron Tincture	2 g.
Orseille (Red Dye)	0.2 g.
Rose Oil	2 g.
Musk, Tincture	1 g.
Lemon Oil	1 g.

Eau de Cologne (50%)

Bergamot Oil	10 cc.
Lemon Oil	14 cc.
Citral	1.4 cc.
Thyme Oil, White	2.6 cc.
Rosemary Oil	3.4 cc.
Lavender Oil	10 cc.
Ixolene, Extra	3.4 cc.
Alcohol	500 cc.
Water	500 cc.

Chypre Head Lotion

Geraniol, C.P.	1.4 cc.
Cedar Wood Oil, Rectified	0.25 cc.
Benzyl Acetate, Chlorine-Free	0.6 cc.
Hydroxycitronellal, C.P. (100%)	0.7 cc.

Storax Oil	0.25	cc.
Geranium Oil, Réunion	0.6	cc.
Benzyl Benzoate	2.5	cc.
Linalyl Acetate	0.8	cc.
Linalool, Extra	1.2	cc.
Anise Aldehyde	0.1	cc.
Iris Oil, Genuine, Concrete	0.05	cc.
Coumarin	0.15	g.
Civet, Genuine (100%)	0.02	g.
Patchouli Oil, Genuine	0.2	cc.
Musk, Artificial, "Ambrette"	0.2	g.
Musk, Artificial, "Ketone"	0.05	g.
Labdanum Extract	0.15	cc.
Vanillin	0.13	g.
Phenylethyl Alcohol	0.6	cc.
Rosemary Oil	0.05	cc.
Alcohol	670	cc.
Distilled Water	320	cc.

Alcoholic Sulphur Hair Lotion

Sulphur Glycerin Solution (24%)	5	g.
Water	20	cc.
Salicylic Acid	0.5	g.
Menthol	0.3	g.
Alcohol (24%)	70	cc.
Perfume	to suit	

Preparation for Head Massage
German Patent 616,362

Lauryl Sulphonate	25	g.
Buckwheat Flour	30	g.
Henna	10	g.
Salicylic Acid	5	g.
Sulphur	5	g.
Castor Oil	5	cc.

Scalp Stimulant

Deodorized Kerosene	80	oz.
Resorcinol Monoacetate	3	oz.
Lanolin	10	oz.
Diglycol Laurate	7	oz.

Hair Wave Concentrate

Karaya Gum	3	g.
Glycol Bori-Borate (Liquid)	6	g.

Rub together until smooth. Stir in

Alcohol, Anhydrous	48	g.

Hair Setting Concentrate

Karaya Gum	12	g.
Glycerin or Glycol	12	g.
Alcohol	30	cc.
Perfume	to suit	

The above is added to one pint of water for use.

Liquid Hair Fixative

Tragacanth, Powder	0.2–0.5	g.
Glycerin, C.P.	5–10	g.
Alcohol (95%)	1	g.
Distilled Water	93.8–88.5	cc.

Dissolve gum in hot water, adding it together with the glycerin (ground together previously), filter; perfume with water soluble essential oils, or use orange flower (rose flower) water instead of distilled water, then dye pale green.

If paste is wanted for collapsible tubes, use 3–4 g. of gum tragacanth.

Brilliantine

Oil of Bitter Almond	1.5	cc.
Oil of Clove	3	cc.
Oil of Bergamot	6	cc.
Castor Oil	50	cc.
Glyceryl Monoricinoleate	50	g.
Suet	50	g.

Non-Greasy Brilliantine

Diglycol Laurate	40	cc.
Alcohol	60	cc.
Perfume and Color	to suit	

Hair Fixative Creams

The simplest type of fixative cream is a tragacanth mucilage containing up to 25% of liquid paraffin, more or less emulsified. Such creams require vigorous shaking, as the oil separates on standing. Permanent creams which now enjoy tremendous popularity, thanks to good advertising and their own inherent good qualities, are of two types:—oil-in-water emulsions and water-in-oil emulsions, the oil in both cases being mainly liquid paraffin. The most popular of these new fixatives is of the second type, a water-in-oil emulsion. It is not, as it is often supposed, a triethanolamine emulsion, but resembles a semi-liquid cold cream. A formula for this type of cream, which has been published and widely quoted, is as follows:

Formula No. 1

Liquid Paraffin	3000	cc.
White Beeswax	100	g.
Borax	6	g.
Water	150	cc.

No. 2

Liquid Paraffin	45	cc.
Stearic Acid	5	g.
Water	49	cc.
Triethanolamine	1	cc.
Perfume	to suit	

Add the liquid paraffin and stearin heated to about 65° C. to the solution of triethanolamine in water at the same

temperature, and stir until it thickens. When nearly cold add the perfume. Avoid too vigorous stirring which causes frothing.

This formula gives a very thick cream which can easily be thinned by diluting with water if desired.

Hair Fixative Perfumes

The popular ingredients include the citrus oils (orange, lemon, bergamot and lime), lavender, rosemary, geranium, petitgrain and coumarin; about 1% of perfume is sufficient. The following table will serve as a guide:

Formula	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Bergamot Oil	55 cc.	20 cc.	45 cc.	40 cc.	50 cc.	40 cc.
Lavender Oil	10 cc.	50 cc.	—	50 cc.	—	40 cc.
Lemon Oil	3 cc.	—	20 cc.	—	—	—
Orange Oil	5 cc.	—	5 cc.	—	15 cc.	—
Lime Oil	5 cc.	—	5 cc.	—	—	—
Petitgrain Oil	15 cc.	15 cc.	25 cc.	—	10 cc.	—
Rosemary Oil	5 cc.	5 cc.	—	—	5 cc.	—
Geranium Oil	2 cc.	—	—	—	15 cc.	20 cc.
Coumarin	—	10 g.	—	10 g.	5 g.	—

Hair Oil

Formula No. 1

Alcohol, Ethyl	400 cc.
Glycerol	200 cc.
Perfume, as desired, about	1 cc.
Salicylic Acid	2 g.
Water	400 cc.

No. 2

Alcohol, Ethyl	400 cc.
Glycerol	300 cc.
Perfume, as desired, about	1 cc.
Salicylic Acid	2 g.
Water	300 cc.

Lavender coloration may be effected by the addition of traces of ferric chloride. The preparation is completely water soluble, hence readily removed by washing, yet it serves as an excellent "stay-comb."

Soapless Shampoo

Lohrinol (Wetting Out Agent)	450 g.
Mineral Oil	50 g.
Alcohol	300 g.
Water	to make 1 l.

Soapless Shampoo Powder

Borax	25 oz.
Sodium Bicarbonate	25 oz.
Soda Ash	48 oz.
Saponin	2 oz.

"Oil-Hair Wash"

Formula No. 1

Diethylaminoethyloleyl Citrate	15 g.
Chamomile Extract	1 cc.
Lemon Juice	2 cc.
Water, Distilled, or Alcohol (50%)	81.5 cc.

No. 2

Rape Seed Oil	50 cc.
Hazelnut Oil	30 cc.
Spike Lavender Oil	5 cc.

Egg Shampoo

Prepare just before use.

Separate the yolks and whites of four or more eggs in separate bowls. To the yolks add a tablespoonful of cold water and beat until uniform with an egg-beater. Wash off the beater and beat the whites until fluffy and firm. Add the beaten yolks to the whites and fold the former into the latter. The hair is washed and rinsed with lukewarm water. Then work the egg shampoo, a little at a time, into the scalp and hair. Finally wash and rinse the hair with a strong spray of tepid (not hot) water.

Shampoo Powder

Sulphonated Lorol or Lohrinol	40 g.
Borax	40 g.
Sodium Sesquicarbonate	20 g.

This gives an excellent lather.

Many such additions will suggest themselves to those who wish to experiment. Some people include a specially prepared saponin, 2 to 5%, to help the lather-producing properties.

Liquid Hair Shampoo

Potash Soft Soap	50 g.
Potassium Carbonate	5 g.

Glycerin	7	g.
Benzaldehyde	0.25	g.
Distilled Water	938	cc.

The procedure is to dissolve the soft soap, with gentle heating, in half the water. The potash, glycerin and benzaldehyde are incorporated in the rest of the water. After the two solutions have been well mixed by stirring, the finished product is left for a week before decanting, filtering and bottling. At first the perfume will be found to disappear, owing to the splitting up of the benzaldehyde into sodium benzoate and benzyl alcohol—but after the lapse of some days the characteristic almond odor will reappear, owing to the oxidation of the alcohol back to the aldehyde.

In the above formula, the soap content may naturally be increased if desired—also a proportion of alcohol may be added. Instead of the almond perfume imparted above, a stable fougère or similar compound can be employed. Likewise pine tar, or a 10% solution of henna, may be incorporated in the case of antiseptic or liquid henna shampoos respectively. Novel ingredients for imparting a pleasantly "medicated" odor include iso-thymol.

In the manufacture of liquid soap shampoos, careful control at all points is essential. Turbidity must at all costs be avoided, and for this reason distilled water only should be used and the soap itself completely saponified. Unless proper facilities are available for saponification on the premises, it is better to purchase a ready-made soft soap base (carefully standardized examples of which are now on the market).

Shampoos should, in certain cases, be aged for even longer than a week (e.g., 15 to 30 days), then decanted into a tank fitted with a refrigerating coil, chilled to a low temperature and finally filtered through asbestos. It has been suggested that the period of aging can be radically reduced by first running the shampoo through a colloid mill or homogenizer.

Hair Wash

Liquid Soap	90–95	oz.
Triethanolamine Laurate	10–5	oz.
Alcohol	10–5	oz.

Hair Washing Soaps

Formula No. 1 (for Oily Scalp)

Coconut Oil	11,000	g.
Castor Oil	4,750	g.
Caustic Potash (50%)	about 7,515	g.
Distilled or Softened Water	76,000	cc.
Perfume, or Chamomile Extract, or Wood Tar, Pure, or Better Perfume Blended with Extract	500– 2,000	cc.

No. 2

Coconut Oil	11,000	g.
Olive Oil	4,750	g.
Caustic Potash (50%)	about 7,520	g.
Distilled or Softened Water	76,000	cc.
Perfume or Extract	500– 2,000	cc.

No. 3 (for Dry Scalp)

Coconut Oil	15,000	g.
Olive Oil	6,000	g.
Caustic Potash (50%)	10,200	g.
Glycerin	10,000	g.
Alcohol (95%)	6,000	cc.
Distilled or Softened Water	53,000	cc.
Perfume or Extract	500– 2,000	cc.

Dandruff Remover

Mercury Bichloride	0.5	g.
Resorcinol	5	g.
Alcohol	125	cc.
Water	125	cc.

Dissolve the bichloride and the resorcinol in the water. Then add alcohol. Apply on the dry scalp and rub thoroughly—then shampoo the hair. One treatment a week is usually sufficient for a complete absence of dandruff.

Dandruff Lotion

Salicylic Acid	2	oz.
Sulphur (Precipitated)	4	oz.
Castor Oil	10	oz.
Gum Tragacanth	1	oz.
Glycerin	1	oz.
Perfume	0.5	oz.
Water	82	oz.

Henna, White

Henna white is a bleach, varying in composition with various users. One formula, sodium perborate, 18 g.; henna leaves, 2 g.; affords an excuse for the name. No other excuse can be seen for the waste of henna leaves. Some use

Magnesium Carbonate	68	g.
Sodium Perborate	32	g.

Make into a paste a 50–50 mixture of hydrogen peroxide and water before use.

Birch Water

Birch Bud Oil	10	g.
Glycerin	40	g.

Soap Spirit	250	g.
Ethanol or Isopropyl Alcohol	650	g.
Bergamot Oil	5	g.
Geranium Oil	1	g.
Orange Flower Oil	0.5	g.
Water	50	g.

Florida Water

Neroli Oil, "Bigarade"	5	cc.
Lavender Oil, English	5	cc.
Bergamot Oil	30	cc.
Limette Oil	2	cc.
Clove Oil	2	cc.
Cassia Oil	3	cc.
Cinnamon Oil	1	cc.
Rose Oil	5	cc.
Ambra, Liquid, Artificial	2	cc.
Orange Flower Water, Triple	100	cc.
Alcohol (90%)	900	cc.

Hungary Water

Rosemary Oil	20	cc.
Verveine Oil	7	cc.
Portugal Oil	1.5	cc.
Limette Oil	1	cc.
Peppermint Oil	0.5	cc.
Rose Water, Triple	100	cc.
Alcohol (90%)	800	cc.

Let stand up to 6 months before marketing.

Eau de Lubin

Alcohol	650	cc.
Portugal Oil	1.2	cc.
Neroli Oil	0.6	cc.
Jasmine, Absolute	0.6	cc.
Myrtle Oil	3	cc.
Geranium Oil, French	1.2	cc.
Lemon Oil	3	cc.
Bergamot Oil	9	cc.
Civet Tincture	3	cc.
Castoreum Tincture	3	cc.
Peruvian Balm	3	cc.
Musk Tincture	3	cc.
Tolu Balm Tincture	6	cc.
Benzoin Tincture	24	cc.
Myrrh Tincture	6	cc.
Clove Tincture	60	cc.

Aqua Mellis

Honey	5	g.
Bergamot Oil	8	cc.
Lavender Oil, French	1	cc.
Clove Oil	1	cc.
Mace Oil	0.5	cc.
Coriander Oil	1	cc.
Sandal Wood Oil	3.5	cc.
Benzoin Resinoid	5	cc.
Musk Tincture (2%)	2	cc.
Rose Water, Triple	100	cc.
Orange Flower Water, Triple	100	cc.
Alcohol	800	cc.

Eau de Lavende, Ambrée

Lavender Oil, French	50	cc.
Bergamot Oil	12	cc.
Musk Infusion	12	cc.
Ambreine	8	cc.
Lemon Oil	6	cc.
Benzoin Infusion	6	cc.
Idola	2	cc.
Alcohol (96%)	2500	cc.
Water, Distilled	500	cc.

Eau de Cologne

Formula No. 1

Lemon Oil	18	g.
Bergamot Oil	16	g.
Orange Oil, Sweet	5	g.
Lavender Oil, Extra	4	g.
Mandarin Oil	3.2	g.
Petitgrain Oil, Grasse	3.2	g.
Benzoin Resinoid	3.2	g.
Neroli Oil, Original	2.8	g.
Orange Oil, Bitter	2.8	g.
Lime Oil	2.7	g.
Rosemary Oil	1	g.
Eugenol	0.6	g.
Cumin Aldehyde (10%)	0.5	g.
Muscatel Sage Oil	0.3	g.
Hysop Oil	0.1	g.
Cardamom Oil	0.1	g.
Iris, Concrete (10%)	0.1	g.
Alcohol (96%)	1800	cc.
Water, Distilled	200	cc.

No. 2

Bergamot Oil	20	g.
Lemon Oil	14	g.
Lavender Oil	5	g.
Benzoin Resinoid	5	g.
Nerosol	5	g.
Orange Oil, Sweet	4	g.
Mandarin Oil	4	g.
Petitgrain Oil, Paraguay	2.6	g.
Rosemary Oil	2.3	g.
Neroli Oil	2	g.
Muscatel Sage Oil	2	g.
Jasmine Aldehyde	0.7	g.
Resinoid Iris	0.5	g.
Alcohol (96%)	1800	cc.
Water, Distilled	200	cc.

No. 3

Lemon Oil	20	g.
Heliotropin	7	g.
Bergamot Oil, Natural	5	g.
Bergamot Oil, Artificial	6	g.
Terpinyl Acetate	4	g.
Neroli Oil, Artificial	4	g.
Orange Oil, Sweet	4	g.
Coumarin	2.5	g.
Benzyl Acetate	1.5	g.

Ketone Musk	0.7	g.
Citral	0.6	g.
Alcohol (96%)	1600	cc.
Water, Distilled	400	cc.

Ambre Eau de Cologne

Bergamot Oil	20	g.
Lemon Oil	20	g.
Heliotropin	7	g.
Ambrette Musk	2.6	g.
Lavender Oil	2.6	g.
Petitgrain Oil, Paraguay	2.6	g.
Methyl Ionone	2.6	g.
Vanillin	2	g.
Rose Oil, Artificial	2	g.
Rosemary Oil	0.7	g.
Neroli Oil	0.7	g.
Coumarin	0.7	g.
Ambre, Artificial	0.6	g.
Rose Absolute, Synthetic	0.1	g.
Alcohol (96%)	1800	cc.
Water, Distilled	200	cc.

Chypre, Eau de Cologne

Lemon Oil	18	g.
Bergamot Oil	16	g.
Rose Oil, Artificial	6	g.
Lavender Oil	4	g.
Coumarin	4	g.
Sandal Wood Oil, East India	2.6	g.
Ketone Musk	2.6	g.
Vetivert Oil, Java	2	g.
Rosemary Oil	2	g.
Muscatel Sage Oil, Artificial	2	g.
Iso-Eugenol	0.7	g.
Patchouli Oil	0.7	g.
Vanillin	0.5	g.
Neroli Oil	0.5	g.
Thyme Oil	0.5	g.
Mousse de Chêne, Absolute	0.5	g.
Alcohol (96%)	1800	cc.
Water, Distilled	200	cc.

Eau de Cologne "Russe"

Lemon Oil	9	g.
Bergamot Oil	9	g.
Methyl Ionone	6	g.
Heliotropin	4	g.
Lavender Oil	4	g.
Iso-Eugenol	3	g.
Vanillin	2.6	g.
Ketone Musk	2	g.
Rosemary Oil	2	g.
Linalyl Acetate	2	g.
Ambrette, Musk	0.7	g.
Neroli Oil	0.7	g.
Coumarin	0.6	g.
Ambre, Artificial	0.6	g.
Alcohol (96%)	1800	cc.
Water, Distilled	200	cc.

Eau de Cologne for the Bath

Bergamot Oil, Free of Terpenes	17	cc.
Petitgrain Oil, Free of Terpenes	14	cc.
Rosemary Oil	1.75	cc.
Citral	1.75	cc.
Tincture of Benzoin	56	cc.
Orange Flower Water	340	cc.
Alcohol (96%)	1800	cc.
Water, Distilled	3600	cc.

Ice—Bay Rum

Bay Oil	8	g.
Menthol	16	g.
Glycerin, C.P.	16	g.
Glycerin (Soap Lye)	20	g.
Rum Essence	80	g.
Alcohol (96%)	2000	cc.
Water, Distilled	800	cc.

Eau de Lavende

Lavender Oil, Barrême (France)	40	cc.
Musk Infusion	12	cc.
Ambre Infusion	12	cc.
Bergamot Oil	12	cc.
Lemon Oil	6	cc.
Jasmine Aldehyde	2	cc.
Phenyl Ethyl Alcohol	0.6	cc.
Alcohol (96%)	1100	cc.
Water, Distilled	300	cc.

Perfumes for Shaving Creams

Eau de Cologne Perfume

Bergamot Oil	100	g.
Lemon Oil	50	g.
Portugal Oil	35	g.
Rosemary Oil	25	g.
Lavender Oil	30	g.
Petitgrain Oil	30	g.
Neroli, Synthetic	20	g.

Bitter Almond Perfume

Bitter Almond Oil	60	cc.
Bergamot Oil	10	cc.
Lavender Oil	5	cc.

Fancy Perfume

Lavender Oil	150	cc.
Portugal Oil	450	cc.
Bergamot Oil, Synthetic	750	cc.
Lemon Oil	150	cc.
Benzaldehyde	30	cc.

Almond Perfume

Peru, Balsam	100	g.
Heliotropin	125	g.
Musk, Tincture	50	g.

Vanillin	15 g.
Almond Oil	10 g.
Neroli, Synthetic	5 g.

Lavender Perfume

Lavender	75 g.
Lavender Spike Oil	75 g.
Geranium Oil	75 g.
Coumarin	2 g.
Sandal Wood Oil	2 g.
Bergamot Oil	100 g.
Lemon Oil	25 g.

Rose Perfume

Pelargol	100 g.
Diphenyl Oxide (1 : 1)	25 g.
Vanillin	10 g.
Geraniol	75 g.
Terpineol	20 g.

Violet Perfume

Bergamot Oil	100 g.
Iris Resinoid	30 g.
Neroli	25 g.
Benzoin Infusion	75 g.
Terpineol	50 g.
Violet (5187, Heine)	125 g.
Jasmine Flower Oil	40 g.
Fixol—Violet	50 g.

Extract, Rose

Red Rose Flower Oil	40 cc.
Nerol	30 cc.
Phenyl Ethyl Alcohol	20 cc.
Jasmine Aldehyde	16 cc.
Neroli Oil	12 cc.
Ambrette Musk	10 cc.
Rose Absolute, Synthetic	9 cc.
Iris, Concrete	5 cc.
Tuberose, Artificial	3 cc.
Bergamot Oil	2 cc.
Narcisse, Artificial	2 cc.
Vetivert Oil, Java	1 cc.
Sandal Wood Oil, East India	1 cc.
Alcohol (96%)	1500 cc.
Water	150 cc.

Lilac Perfume

Anisic Aldehyde	10 cc.
Jasmine, Synthetic	10 cc.
Heliotropin	5 cc.
Phenyl Ethyl Alcohol	5 cc.
Phenyl Acetaldehyde	5 cc.
Oil Bergamot	3 cc.
Musk Ketone	3 cc.
Styrax Resin	2 cc.
Oil Ylang Ylang	2 cc.
Terpineol	55 cc.

Individual touches may be imparted to the above by the sparing use of any or all of the following: amyl salicylate, acetophenone, methyl anthranilate, benzyl acetate, cinnamic alcohol, benzyl benzoate, hydroxycitronellol, and oil nutmeg.

Perfume for Cholesterin Creams

1. Orange Flower Water instead of water:

Neroli Oil, Artificial	9 g.
Aubépine	1 g.

2. Rose Water instead of distilled water:

Rose Oil	1 g.
Geranium Oil, African	1 g.
Bergamot Oil	5 g.

3. Rose Water instead of distilled water:

Geranium Oil	5 g.
Anisaldehyde	5 g.
Linalylacetate	2 g.
Eugenol	1 g.

The three mixtures are added to creams made with Rose Water or Orange Flower Water instead of distilled water. (Usual percentage of perfume.)

PERFUME BASES

	New Mown Hay	Chypre	Locust
Alpha Ionone	10	—	—
Citronellol	20	—	—
Amyl Salicylate	100	25	5.5
Anisic Aldehyde	20	—	—
Coumarin	5	—	—
Vanillin	5	5	—
Heliotropin	7	—	7
Linolool	10	10	2.5
Petitgrain	10	20	2.5
Jasmine, Artificial	20	25	4
Patchouli Oil	1	25	—
Aldehyde C_{10}, 50%	1	—	.15
Iso Eugenol	5	—	2.3
Phenyl Ethyl Alcohol	—	25	20
Musk Xylol	—	25	—
Copaiba, Balsam	—	15	—
Birch Tar	—	10	—
Lemon Oil	—	3	—
Bergamot Oil	—	100	—
Rose, Artificial	—	75	—
Cedar Oil	—	15	—
Phenyl Acetic Aldehyde, 50%	—	—	1
Phenyl Acetic Acid	—	—	.25
Hydroxycitronellol	—	—	12.5
Cinnamic Alcohol	—	—	3.5
Cananga Oil	—	—	3
Methyl Heptine Carbonate, 5%	—	—	1.0
Geranyl Acetate	—	—	1.3
Amyl Cinnamic Aldehyde	—	—	5

	Flowery Bouquet	Bouquet	Oriental	Oriental A
Rose Geranium Oil..	100	—	—	—
Rose, Artificial	20	—	—	—
Valley Lily, Artificial	500	500	350	100
Terpineol	200	—	110	100
Hydroxycitronellal ..	200	—	—	—
Bois de Rose	200	—	—	—
Coumarin	30	100	—	—
Anisic Aldehyde	20	—	30	30
Methyl Anthranilate.	150	20	—	—
Civet Tincture	50	—	100	60
Hyacinth, Artificial..	100	—	—	—
Benzyl Benzoate ...	200	200	200	100
Musk Ambrette	50	—	50	30
Opoponax	10	—	200	100
Oak Moss, Liquid ...	200	—	100	50
Cananga Oil	100	—	—	—
Lavender Oil	—	20	20	10
Bergamot Oil	—	100	—	—
Cassia Oil	—	10	—	—
Tuberose, Artificial .	—	100	—	—
Methyl Heptine Carbonate, 5%	—	100	—	—
Geraniol	—	100	—	—
Vanillin	—	100	—	—
Musk Ketone	—	50	—	—
Orange Blossom, Artificial	—	—	610	100
Jasmine, Artificial ..	—	—	440	—
Vetivert Oil	—	—	—	100
Jasmine Aldehyde ..	—	—	—	200
Petitgrain Oil	—	—	—	100
Phenyl Ethyl Alcohol	—	—	—	30
Linalyl Acetate	—	—	—	50
Linalool	—	—	—	50

	Flowery Bouquet A	Bouquet A	Bouquet B
Aldehyde C_9	20	20	20
Oak Moss, Liquid	100	—	—
Jasmine Liquid, Absolute	500	200	200
Rose, Artificial	500	1000	300
Iso Butyl Salicylate	200	100	100
Methyl Ionone	500	—	300
Lilac, Artificial	500	200	300
Musk Ketone	200	—	200
Methyl Heptine Carbonate, 5%	50	—	—
Valley Lily, Artificial ...	500	200	—
Bois de Rose	200	200	200
Melittis (Givaudan)	200	—	—
Orange Blossom, Artificial	—	300	300

	Flowery Bouquet A	Bouquet A	Bouquet B
Methyl Phenyl Acetate ..	—	40	—
Musk Ambrette	—	100	—
Para Cresyl Phenylacetate	—	50	—
Vanillin	—	30	—
Aldehyde C_{10}, 5%	—	100	100
Olibanum Gum, 2 : 1	—	150	—
Terpineol	—	—	200
Hydroxycitronellal	—	—	200
Cananga Oil	—	—	100
Rose Geranium Oil	—	—	100
Coumarin	—	—	30
Anisic Aldehyde	—	—	20
Methyl Anthranilate	—	—	100
Civet Tincture	—	—	50
Labdanum	—	—	100
Coriander Oil	—	—	20
Castoreum, 10%	—	—	100
Ambergris Tincture	—	—	100

	Chypre A	Bouquet C	Bouquet D
Jasmine, Artificial	200	500	80
Musk Ketone	400	200	500
Oak Moss, Liquid	500	100	—
Bergamot Oil	1000	—	—
Rose, Absolute	400	—	—
Patchouli Oil	500	—	—
Musk Tincture	200	—	200
Vanillin	100	—	—
Coumarin	200	—	—
Indol, 5%	100	—	—
Hydroxycitronellal	200	—	—
Lemon Oil, Terpeneless.	30	—	—
Phenyl Ethyl Alcohol ..	—	100	—
Methyl Ionone	—	500	—
Aldehyde C_9, 50%	—	40	—
Methyl Heptine Carbonate, 10%	—	50	—
Melittis	—	200	—
Iso Butyl Salicylate ...	—	200	—
Rhodinol	—	500	150
Lilac, Artificial	—	500	—
Valley Lily, Artificial ..	—	500	—
Bois de Rose	—	200	—
Cassie, Artificial	—	—	60
Benzyl Benzoate	—	—	1000
Diethyl Anthranilate ...	—	—	50
Linalyl Acetate	—	—	300
Benzyl Acetate	—	—	300
Tolu, Balsam	—	—	300
Rose, Artificial	—	—	90

	French Type	French Lilac Type
Oak Moss, Liquid	200	—
Bergamot Oil, Terpeneless	150	—
Linalyl Acetate	50	—
Sweet Orange Oil	200	—
Valley Lily, Artificial	300	—
Narcissus Absolute	100	—
Jasmine, Artificial	400	200
Rhodinol	200	—
Alcohol C_9	70	—
Aldehyde C_9, 5%	100	30
Linalool	200	—
Geranyl Acetate	200	—
Methyl Phenylacetate	50	—
Alpha Ionone	100	—
Vetivert Oil	100	—
Terpineol	100	100
Coumarin	200	—
Vanillin	100	—
Musk Ketone	100	100
Canada Snake Root Oil	100	—
Hydroxycitronellal	—	2000
Geraniol	—	50
Phenyl Acetic Aldehyde, 50%	—	50
Phenyl Ethyl Alcohol	—	300
Anisic Aldehyde	—	20
Rose, Artificial	—	30
Labdanum	—	100

	Bouquet E	Violet
Bergamot Oil, Terpeneless	200	—
Linalyl Acetate	100	—
Jasmine, Artificial	500	100
Aldehyde C_9, 5%	100	—
Vetivert	100	—
Coumarin	400	—
Rose Geranium Oil	200	—
Rose, Artificial	100	—
Bay Oil, Terpeneless	300	—
Eugenol	100	—
Petitgrain Oil	400	—
Bergamot Oil	300	—
Indol, 5%	150	—
Ambreol	500	—
Lavender	150	—
Raldeine D	300	100
Lemon Oil	20	—
Rhodinol	—	100
Alpha Ionone	—	1000
Hydroxycitronellal	—	300
Cananga Oil	—	100
Aldehyde C_{12}, 5%	—	100
Methyl Heptin Carbonate, 10%	—	200
Cassie, Artificial	—	100
Guaiac	—	300
Methyl Ionone	—	100
Orris, Liquid, 10%	—	175

	Jasmine	Sweet Pea	Heavy Oriental
Benzyl Acetate	1500	—	—
Bergamot Oil	150	300	3000
Bois de Rose	150	—	200
Benzyl Alcohol	300	—	—
Phenyl Ethyl Alcohol	300	—	—
Indol, 5%	50	—	—
Hydroxycitronellal	250	200	200
Orange Blossom, Artificial	250	200	—
Cananga Oil	150	—	200
Jasmine Absolute	300	200	—
Amyl Cinnamic Aldehyde	100	—	—
Benzylidene Acetone	—	150	—
Heliotropin	—	450	100
Musk Ketone	—	50	—
Phenyl Acetic Aldehyde, 50%	—	100	—
Terpineol	—	1000	—
Iso Butyl Phenylacetate	—	120	—
Rose, Artificial	—	80	—
Tolu	—	150	—
Alcohol C_9	—	60	—
Benzyl Benzoate	—	150	400
Anisic Aldehyde	—	—	100
Lavender Oil	—	—	60
Tolyl Acetate	—	—	100
Vanillin	—	—	200
Oak Moss, Liquid	—	—	400
Aldehyde C_{10}, 5%	—	—	160
Diethyl Anthranilate	—	—	580
Ambreol	—	—	600

	Carnation	Honeysuckle
Eugenol	1600	—
Jasmine, Artificial	400	1500
Heliotropin	400	—
Rose, Artificial	100	—
Phenyl Ethyl Alcohol	50	2000
Orange Blossom, Artificial	100	200
Ocillet	100	—
Orris Liquid, 10%	150	—
Musk Ketone	100	—
Ambreol	100	—
Benzyl Iso Eugenol	100	—
Bergamot Oil	—	600
Indol, 5%	—	250
Hydroxycitronellal	—	1000
Benzyl Acetate	—	5000
Benzyl Butyrate	—	500
Benzyl Formate	—	200
Benzyl Propionate	—	2000
Benzyl Benzoate	—	2000
Bois de Rose	—	700
Aurania	—	800
Cananga Oil	—	1000
Amyl Cinnamic Aldehyde	—	500
Para Cresol, 10%	—	100
Petitgrain Oil	—	500

	Lilac	Rose	Orange Blossom	Heavy Modern Oriental
Citronellol	10	30	3	—
Cananga Oil	20	5	—	—
Amyl Cinnamic Aldehyde	10	—	—	50
Methyl Acetophenone	5	—	—	—
Hydroxycitronellal	10	—	10	—
Phenyl Ethyl Alcohol	11	20	—	—
Linalool	10	5	10	—
Terpineol	20	—	—	—
Methyl Para Cresol	1	—	—	—
Musk Ketone	5	—	—	—
Valley Lily, Artificial	10	—	—	—
Iso Eugenol	5	—	—	—
Aldehyde C_{10}, 5%	—	5	—	—
Benzyl Acetate	—	10	30	—
Geraniol	—	50	—	—
Ionone	—	5	—	—
Geranyl Acetate	—	10	—	—
Copaiba Balsam	—	10	10	—
Patchouli Oil	—	2	—	—
Phenyl Acetic Acid	—	2	2	—
Linalyl Acetate	—	3	—	—
Petitgrain Oil	—	—	100	—
Methyl Anthranilate	—	—	15	—
Beta Naphthyl Ethyl Ester	—	—	10	50
Amyl Salicylate	—	—	—	30
Ionone	—	—	—	10
Benzylidene Acetone	—	—	—	6
Musk Xylol	—	—	—	5
Vanillin	—	—	—	3

Lily-of-the-Valley Flower Oil

Geraniol, from Palmarosa Oil	25	g.
Linalool, from Rosewood Oil	12.5	g.
Phenylethyl Alcohol	15	g.
Phenylacetaldehyde Dimethylacetal	5	g.
α-Ionone	1.5	g.
Benzaldehyde	0.1	g.
Jasmine Flower Oil, Artificial	10	g.
Rose Oil, Artificial, Extra Fine	8	g.
Lilac Flower Oil, Artificial	25	g.
Ylang Ylang Oil, Manila	4	g.
Rhodinol	10	g.
Coriander Oil, Terpene-Free	0.5	g.
Hydroxycitronellal Dimethylacetal	20	g.
Hydroxycitronellal Diethylacetal	40	g.

Lilac Flower Oil

Ylang Ylang Oil, Manila	1	g.
Jasmine Flower Oil, Artificial	12	g.
Rhodinol	6	g.
Acacia Flower Oil, Artificial	2	g.
Hydroxycitronellal Diethylacetal	30	g.
Terpineol, Extra	20	g.
Phenylacetaldehyde Dimethylacetal	4	g.
Aubépine (from Anethol)	2	g.
Heliotropin	12	g.
Iso-Eugenol	1.5	g.
Vanillin	0.5	g.
Octyl Acetate (10%) in Benzyl Alcohol	0.5	g.

Perfume Oil, Type "Tosca"

Formula No. 1

Orange Oil, Sweet, Calabrian	8.5	cc.
Bergamot Oil, Extra Fine, Reggio	17	cc.
Lemon Oil	19	cc.
Ylang Ylang, Genuine	6	cc.
Rose Oil, Genuine, Bulgarian	2.5	cc.
Jasmine, Pure	1.3	cc.
Coumarin	6.5	g.
Musk, Artificial, "Ambrette"	1	g.
Musk, Artificial, "Ketone"	1	g.
Cedar Wood Oil, Rectified	5.5	cc.
Neroli Oil, Genuine	2.5	cc.
Geraniol, C.P.	4	cc.
Phenylethyl Alcohol	1.5	cc.
Benzoin Extract, Filtered	5	cc.
Petitgrain Oil	1.5	cc.
Linaloë Oil, Cayenne	6	cc.
Sandal Wood Oil, East Indian	5.5	cc.
Indol (100%)	0.07	cc.
Iris Oil, Genuine, Concrete	1.5	cc.
Castoreum (100%)	0.05	g.
Basilicum Oil	0.03	cc.
Undecyl Aldehyde (100%)	0.05	cc.
Mousse de Chêne, Liquid	0.5	cc.
Vanillin	3	g.
Menthol	0.5	g.

No. 2

Bergamot Oil, Extra Fine	11	cc.
Lemon Oil	26.5	cc.
Orange Flower Water Oil, Genuine	1	cc.
Ylang Ylang Oil, Genuine	9	cc.
Sandal Wood Oil, East Indian	8	cc.
Amyl Salicylate	3.5	cc.
Iris Oil, Genuine, Concrete	1	cc.
Civet, Genuine (100%)	0.22	cc.
Patchouli Oil	1.5	cc.
Coumarin	4	g.
Vanillin	5	g.
Rose Oil, Bulgarian	3.5	cc.
Petitgrain Oil	1.5	cc.
Musk, Artificial, "Ketone"	6	g.
Geraniol, C.P.	6.5	cc.
Benzoin Extract, Filtered	5	cc.
Undecyl Aldehyde (100%)	0.2	g.
Birch Tar Oil, Twice Rectified	0.03	cc.
Cedar Wood Oil, Rectified	2	cc.
Neroli Oil, Genuine	0.5	cc.
Linaloë Oil, Cayenne	2	cc.
Opoponax Extract	0.05	cc.
Jasmine Oil, Pure	2	cc.

The above-mentioned perfume compositions should be made up 1–2% in a 90% pure alcohol and kept in the dark, shaking from time to time, and filtering after a few weeks.

Perfume Oil, Type "Quelques Fleurs"

Tart ("Herb") Type

Formula No. 1

Olibanum Oil	3	cc.
Geraniol, C.P.	7.5	cc.
Alpha Amyl Cinnamic Aldehyde	2.36	cc.
Citral	5	cc.
Geranium Oil, Réunion	3.5	cc.
Benzyl Alcohol	10	cc.
Linalyl Acetate	7	cc.
Hydroxycitronellal, C.P. (100%)	14	cc.
Heliotropin, Crystallized	10	g.
Cananga Oil, Java	13	cc.
Ionone for Soaps	4	cc.
Methylnonyl Acetaldehyde (100%)	0.14	cc.
Benzyl Acetate, Free of Chlorine	6	cc.
Linaloë Oil, Cayenne	3	cc.
Terpineol, C.P.	11	cc.
Musk, "Ambrette," Artificial	0.5	g.

No. 2

Benzoin, Extract	3	cc.
Olibanum Oil	1.36	cc.
Citronella Oil, Colombo	3	cc.
Cananga Oil, Java	10	cc.
Heliotropin, Crystallized	6	g.
Linaloë Oil, Cayenne	7	cc.
Hydroxycitronellal, C.P. (100%)	7	cc.
Benzyl Acetate, Chlorine-Free	3	cc.
Terpineol, C.P.	26.5	cc.
Citral	3	cc.
Methylnonyl Acetaldehyde (100%)	0.14	cc.
Geranium Oil, Réunion	5.5	cc.
Ionone for Soaps	5.5	cc.
Phenylethyl Alcohol	5	cc.
Linalyl Acetate	4.5	cc.
Anise Aldehyde	6.5	cc.
Alpha Amylcinnamic Aldehyde	3	cc.

Perfume Oil, Type "Quelques Fleurs"

For Fine Soaps (Soft Type)

Cananga Oil, Java	9	cc.
Benzyl Acetate, Free of Chlorine	5	cc.
Ionone for Soaps	5	cc.
Linalyl Acetate	6	cc.
Linaloë Oil, Cayenne	2.3	cc.
Heliotropin, Crystallized	8	g.
Geraniol, C.P.	8	cc.

Musk, "Ambrette," Artificial	3.5	g.
Bergamot Oil	2	cc.
Phenylethyl Alcohol	3.5	cc.
Benzyl Alcohol	9	cc.
Alpha Amylcinnamic Aldehyde	0.5	cc.
Terpineol, C.P.	21	cc.
Indol, Crystallized	0.06	g.
Lemon Oil, Genuine	4	cc.
Anise Aldehyde	4	cc.
Hydroxycitronellal, C.P.	9	cc.
Methylnonyl Acetaldehyde (100%)	0.14	cc.

Perfume Oils "Chypre Extract"

Formula No. 1

Bergamot Oil	33	cc.
Geranium Oil, Réunion	2	cc.
Rose Oil, Genuine, Bulgarian	3.5	cc.
Ylang Ylang Oil, Genuine	2.5	cc.
Rosemary Oil	4	cc.
Coumarin	8	g.
Lavender Oil, Genuine	6	cc.
Jasmine, C.P.	2.4	cc.
Vanillin	3	g.
Anise Aldehyde	5.5	cc.
Cedar Wood Oil, Rectified	1.5	cc.
Patchouli Oil, Genuine	0.5	cc.
Mousse de Chêne, Decolorized	3	cc.
Opoponax Extract	2	cc.
Linaloë Oil, Cayenne	18	cc.
Civet, Genuine (100%)	0.6	g.
Musk, "Ambrette," Artificial	4.5	g.

No. 2

Lemon Oil	12	cc.
Bergamot Oil	9	cc.
Benzyl Acetate, Free from Chlorine	8	cc.
Cedar Wood Oil, Rectified	9.5	cc.
Benzyl Benzoate	6	cc.
Hydroxycitronellal, Pure (100%)	5	cc.
Geraniol, C.P.	7	cc.
Vanillin	4	g.
Benzoin Extract, Filtered	5.5	cc.
Sandal Wood Oil, East Indian	5	cc.
Geranium Oil, Réunion	3	cc.
Coumarin	2	g.
Rose Oil, Genuine, Bulgarian	1	cc.
Linaloë Oil, Cayenne	2.5	cc.
Musk, "Ambrette," Artificial	1.5	g.
Patchouli Oil, Genuine	1.5	cc.
Labdanum Extract	3	cc.
Civet, Genuine	0.3	g.
Olibanum Extract	0.7	cc.
Iris Oil, Genuine, Concrete	1	cc.
Mousse de Chêne, Decolorized	2	cc.
Ylang Ylang Oil, Genuine	5	cc.
Phenylethyl Alcohol	5.5	cc.

Cuticle Remover

Glycerol	20	oz.
Potassium Hydroxide	4	oz.
Water	76	oz.
Perfume	0.3	oz.
Basic Red Dye		trace

The potassium hydroxide is dissolved in the water and the glycerol then added. The perfume usually used is a terpeneless lemon oil. Just enough dye is added to give same a pink color in the bottle.

Cuticle Softener

Formula No. 1

Light Turbine Oil—color and perfume to suit.

No. 2

Diglycol Laurate	10 oz.
Deodorized Kerosene	10 oz.
Perfume	to suit

No. 3

Olive Oil	88 oz.
Petroleum Jelly	12 oz.
Red Dye Oil Soluble to a pink color	trace
Perfume Lilac, enough, about	0.3 oz.

A lower priced product may be prepared by using a medium bodied white mineral oil. The petroleum jelly should be nearly white. This jelly is melted at a low heat and added to the olive oil. The dye is mascerated with a small portion of the oil and this paste is used to tint the entire mass. The perfume is added in amount varying with the strength of the particular product used.

Nail Polish

Formula No. 1

Amyl Acetate	700 g.
Methyl Alcohol	300 g.
Nitrocellulose	50 g.
Benzoin	100 g.
Carmoisine (1% Alcoholic Solution)	50 cc. or to suit

No. 2

Butyl Acetate	250 g.
Ethyl Acetate	150 g.
Ethyl Alcohol	400 g.
Butyl Alcohol	200 g.
Damar	5 g.
Color	to suit

No. 3

Methyl Ethyl Ketone	650 g.
Resorcinol Diacetate	100 g.
Ethyl Lactate	200 g.
Nitrocellulose	100 g.

Sandarac	5 g.
Color	to suit

Sometimes the polish is perfumed with a little ionone or ylang ylang oil, but more often this is not done.

No. 4

Nitrocellulose (Low Viscosity)	225 g.
Damar	75 g.
Butyl Acetate	25 g.
Butyl Alcohol	20 g.
Ethyl Acetate	15 g.
Alcohol	40 g.
Carmine Red	sufficient to color

Nail Polish Powder

Putty Powder (Tin Oxide)	40 oz.
Infusorial Earth (325 Mesh)	55 oz.
Stearic Acid (Powdered)	5 oz.
Color (Pigment)	to suit
Perfume	to suit

Removers, Nail Polish

Formula No. 1

The nail polish remover consists chiefly of the solvent alone. It has been found, however, that butyl stearate has a particularly rapid action on the film, and many modern removers make use of it in conjunction with other solvents. An effective remover can be made by mixing butyl stearate 1 part, amyl acetate 3 parts, and acetone 4 parts. Diglycol laurate is also included to prevent brittleness of nails (about 1–2%).

No. 2

Amyl Acetate	1 oz.
Acetone	1 oz.

No. 3

Amyl Acetate	1 oz.
Alcohol	1 oz.
Acetone	1 oz.
Diglycol Laurate	⅛ oz.

Eyebrow Pencils

Apart from those methods which serve to preserve the eye region in good physical condition, actual beauty treatment is now practiced on a very considerable scale. Coloring of the eyebrows, painting of the eyelashes and shading of the eyelids are now important components of face cosmetics, the greatest attention being devoted to the first operation. Coloring of the eyebrows or their simulation after complete shaving is effected with colored wax pencils. As already mentioned, ordinary pure charcoal pencils tend to cause falling-out and drying of the hair.

Ingredients used in preparing the wax pencils are white wax, benzoated tallow, cocoa butter, petroleum oil and olive oil. The pigments are lamp black, umber, and ochre. Large manufacturers find it economical to use pigment grinding machines and other equipment of the most modern design, but small concerns can nevertheless cope with the production of these cosmetics. The base comprises a composition made up from 110 g. fine petroleum oil, 60 g. white ceresine, 15 g. white wax, 240 g. benzoated tallow, and 1 g. coumarin. The fatty base is thoroughly ground with the pigments, the molten base being gradually stirred into the very finely powdered pigment contained in a mortar. After thorough trituration the mixture is again warmed, digested for about half an hour on a water bath, and again allowed to cool. As soon as the mass begins to thicken, it is again vigorously stirred and forced through a fine-mesh sieve by applying powerful pressure with the pestle. Lumps and impurities are retained upon the sieve. The preparation which passes through the mesh is then again thoroughly mixed, with gentle heating before casting. The mass should be neither too hot nor too fluid when being cast, since settlement of the insoluble pigment will result in lack of uniform coloration. Oil-soluble dyestuffs will certainly only enter into consideration in exceptional cases. According to another process, the melt is prepared from 2 parts cocoa butter, 2 parts ceresine, and 1 part olive oil. Into this is stirred 0.6 part dyestuffs (i.e., about 10% of the total gross weight), which has previously been ground up with a little olive oil.

As soon as the mass has reached the state when it can just be cast, it is emptied into metal moulds. As a rule these impart the required taper to the pencils, but if this is not the case they are tapered after removing from the moulds and wrapped in thick metal foil while leaving the points exposed.

Eyelid Pencils

The production of shading tones on eyelids can be effected with pencils, the composition of which is very similar to that of the eyebrow pencils. The mass consists of the fatty base detailed above with the addition of about 20% ceresine. The color scale is somewhat more varied in the case of these pencils, since a wider range of tones can be induced in the usual brown and bluish black shades. Chestnut is obtained by mixing 225 g.

pale umber and 150 g. mahogany brown with 1000 g. of the molten wax mass. For dark brown tones mix with the same quantity of wax 300 g. of a brun foncé; black shades require for the same wax quantity 100 g. zinc white, 120 g. ultramarine, and 4 g. lamp black.

Regarding the perfuming of these preparations, these should generally be of a very refined character. About 5 to 10 g. of perfume are required for each kilogram of mass. In cases where a fancy perfume is desired, preference should be given to one with a fresh natural odor.

Brown Eyebrow Pencil

Burnt Sienna	80 g.
Burnt Umber	100 g.
Hard Paraffin	420 g.
Soft Paraffin, Yellow	400 g.

Eyebrow and Eyelash Softener

Formula No. 1

Castor Oil	20	oz.
Almond Oil	60	oz.
Perfume	¾	oz.

No. 2

Diglycol Laurate	100	oz.
Acetic Acid, Glacial	¼	oz.
Mineral Oil, Medicinal	200	oz.

No. 3

Beeswax	200 g.
Cocoa Butter	300 g.

Melt together and add:

Peanut Oil	750 g.
Moldex or Other Good Preservative	2 g.

Lipsticks (and Eyebrow Pencils)

Paraffin	2	oz.
Vaseline Oil, White	3	oz.
Beeswax, White	1	oz.
Ozokerite Ceresine	3	oz.
Titanium Dioxide	1	oz.

Colors: For 100 parts use:

Fixation Red (Fixierrot) I No. 46	3.5	oz.
Medium Red (Mittelrot) No. 28	22	oz.

Other red dyes used: Carmine, Nakarat, Fixierrot, Cherry Red, Orient Red.

After Shave Lotions

Formula No. 1

Glycerin	2 g.
Lactic, Citric, or Phosphoric Acid	0.2 g.
Menthol	0.5 g.
Alum	0.3 g.
Perfume	0.5 g.
Alcohol (45%)	96.5 g.

No. 2

Glycerin	5 g.
Alum	1 g.
Zinc Sulphophenolate	0.5 g.
Propyl Alcohol, C.P.	10 g.
Rose Water	10 g.
Perfume	0.5 g.
Alcohol (45%)	72.5 g.

No. 3

Alcohol (40%)	1000 cc.
Glycerin, C.P.	40 g.
Aluminum Lactate	3 g.
Citric Acid	2 g.

No. 4

Zinc Sulyhophenolate	0.5 g.
Alcohol (96%)	15 cc.
Witch Hazel	10 g.
Peruvian Balm	0.25 g.
Glycerin, C.P.	1 g.

No. 5

Distilled Water	20 cc.
Isopropyl Alcohol	4 cc.
Alcohol	4 cc.
Alum	1 g.
Glycerin	0.5 cc.
Zinc Sulphophenolate	0.25 g.

No. 6 (Cloudy)

Emulsone B	50 g.
Boric Acid	50 g.
Isopropyl Alcohol	100 g.
Diethylene Glycol	200 g.
Titanium Dioxide	60 g.
Distilled Water	4 l.
Menthol	2 g.
Moldex or Other Preservative	2 g.

Shaving Creams, Foaming

Formula No. 1

a.	Stearin	25 g.
	Coconut Oil Fatty Acid	8 g.
b.	Caustic Potash (50° Bé.)	15 g.
	Water	50 cc.
	Glycerin	4 g.
c.	Stearin	3 g.

Melt up *a*, then introduce the solution *b* with stirring. Stir until cooled, then introduce *c*. When homogeneous, cover container and let stand over night. Perfume is added the next morning, optionally together with alcohol. Keep 8–14 days in earthenware jars, stir with a wooden rod on each day. In this time, the cream should become softer. If not, treat with a little caustic potash solution (20° Bé).

Perfume: Lavender, Rose, Violet,

Benzaldehyde, or with Eau de Cologne or Chypre.

No. 2

Palm Oil Fatty Acid, Bleached	25 g.
Olive Oil Fatty Acid	25 g.
Coconut Oil Fatty Acid	10 g.
Water	35 cc.
Caustic Potash (50° Bé.)	25 g.

Method as in No. 1.

No. 3

Stearin	30 g.
Coconut Oil, or Fatty Acid	15 g.
Olive Oil, or Fatty Acid	10 g.
Caustic Potash (28° Bé.)	27 g.
Water	32 cc.
Glycerin	6 g.
Stearin	3 g.

Method as in No. 1.

No. 4

Stearin	30 g.
Coconut Oil	11 g.
Caustic Potash (50° Bé.)	17 g.
Water	30 cc.
Glycerin	10 g.
Turkey Red Oil (100%)	2 g. to neutralize alkali

Shaving Cream, Foaming

Formula No. 1

a.	Stearin	30 g.
	Peanut Oil, or Fatty Acid	10 g.
	Coconut Oil, or Fatty Acid	14 g.
b.	Caustic Potash (38° Bé.)	28 g.
	Water	20 g.
	Glycerin (28° Bé.)	12 g.
c.	Stearin	5 g.

Mix *a* in the order of their melting points (lowest first), melt up to 60–70° C., then stir in *b*, warm to 65° C. Stir until cool, add *c* (melted), stir thoroughly, let stand over night. Next morning stir up thoroughly, adding perfume. Cover, let stand, and fill into earthenware jars on next day.

No. 2

Bleached Palm Oil Fatty Acid	50 g.
Olive Oil Fatty Acid	50 g.
Coconut Oil Fatty Acid	20 g.
Water	70 g.
Caustic Potash (50° Bé.)	50 g.

Method as in No. 1.

No. 3

a.	Stearin	90 g.
	Coconut Oil	10 g.
b.	Caustic Potash (50° Bé.)	42 g.
	Glycerin	20 g.
	Water	100 g.
c.	Stearin	10 g.

As in No. 1.

No. 4

a.	Pig Fat	80 g.
	Olive Oil	100 g.
	Tallow	75 g.
	Coconut Oil	60 g.
b.	Caustic Potash (38° Bé.)	160 g.
	Glycerin	25 g.
	Water	15 g.
c.	Stearin	10 g.

As in No. 1.

Brushless Shaving Creams

1.	Glycosterin	25 oz.
	Mineral Oil	10 oz.
	Peanut Oil	5 oz.
	Water	60 oz.
	Moldex or Other Good Preservative	0.2 oz.
2.	Stearic Acid	20 oz.
	Olive Oil	6 oz.
	Lanolin	2 oz.
	Glycerin	6 oz.
	Triethanolamine	2 oz.
	Sodium Carbonate	1 oz.
	Water	63 oz.
	Perfume	to suit

Soapless Shaving Preparations

German Patent 604,774

Formula No. 1

Glycol Stearate	100 g.
Water	400 g.

No. 2

Absorption Base (Parachol)	100 g.
White Beeswax	25 g.
Water	100 g.

No. 3

Glycol Palmitate	100 g.
Petrolatum	100 g.
Water	200 g.

No. 4

Diglycol Laurate	100 g.
Lanolin	100 g.
Petrolatum	50 g.
Water	100 g.

No. 5

Stearic Anilide	100 g.
Glycol Stearate	300 g.
Absorption Base	100 g.
Water	1500 g.

No. 6

Glycol Stearate	30 g.
Absorption Base (Parachol)	100 g.
White Beeswax	30 g.
Sesame Oil	800 g.
Water	600 g.
Saponine	16 g.

Shaving Creams, Non-Foaming

Formula No. 1 (For Fatty Skin)

a.	Stearin	50 g.
	Vaseline	10 g.
b.	Triethanolamine	1.5 g.
	Borax	1.5 g.
	Water	130 cc.
c.	Alcohol (Perfume)	3 g.

Pour *a*, 70° C., into *b*, 60° C. Cool stirring; add *c* before solidification. Pack in collapsible tubes.

No. 2

Stearin	45 g.
Triethanolamine	2.5 g.
Glycerin	15 g.
Water	67.5 cc.
Witch Hazel	50 cc.

Method as in No. 1.

Latherless Shaving Cream

U. S. Patent 1,991,501

A neutral shaving preparation of a latherless type which consists of a mixture of the following ingredients in substantially the proportion stated, stearic acid 11 g., lanolin 10 g., coconut oil 0.3 g., concentrated ammonium hydroxide 1.35 g., paraffin wax 6 g., spermaceti wax 2 g., boric acid 1.5 g., water 75 g., and having a trace each of menthol, camphor and perfume.

Stearic acid and hydrous lanolin containing 20% water, together with coconut oil are melted together, and to this mixture is added the concentrated ammonium hydroxide, which contains approximately 25% of ammonia.

The waxes are then added and heating is continued until the entire mixture is liquefied. The resulting mixture is subsequently removed from the heat and a warm solution of the boric acid in approximately 75 g. of water is added while continuously stirring.

At this point, or at any point previously, the menthol, camphor and selected perfumes are added in amounts which give the most pleasing effect.

The mixture is then violently stirred until cold, and the final resulting product is a white cream.

Shaving Creams, Non-Foaming

Formula No. 1

a.	Stearin	75 g.
	Vaseline	13 g.
b.	Triethanolamine	2 g.
	Borax	2 g.
	Water	195 g.
c.	Alcohol	6 g.

Melt up *a* to 70° C., mix *b* and heat up to 60° C., then pour *a* into *b* with stirring. Shortly before the cooling (solidification) add perfume in the alcohol *c*, stir until cold. Fill into collapsible tubes.

No. 2

Stearin	36 g.
Aminostearin	10 g.
Vaseline	5 g.
Glycerin	5 g.
Water	130 g.

No. 3

Stearin	30 g.
Triethanolamine	10 g.
Witch Hazel	100 g.
Water	45 g.
Glycerin	10 g.

Camphor Shaving Milk

Camphor, Spirits of	50 g.
Glycerin	50 g.
Lavender Oil	2 g.
Alcohol	600 g.

Add:

Borax, Powder	25 g.
Distilled Water	1200 g.
Fresh Lemon Juice	200 g.

Stir; allow to stand over night; filter.

Milky-White Shaving Soap, Liquid

Coconut Oil	30 g.
Tallow	90 g.
Stearic Acid	90 g.
Caustic Potash (50%)	about 90 g.
Potassium Carbonate	1 g.
Distilled or Softened Water	370 g.
Glycerin	120 g.
Alcohol	210 g.
Perfume	2.5–10 g.

Shaving Milks

Formula No. 1

Mix in warmed mortar:

Wool Fat	10 g.
Borax	2 g.
Glycerin	15 g.
Orange Flower Water	40 g.
Rose Water	40 g.
Tincture of Benzoin	10 g.

No. 2

Make up emulsion of:

Almond Oil	20 g.
Glycerin	20 g.
Gum Arabic	20 g.
Rose Water	440 g.

And add:

Glycerin	50 g.
Tincture of Benzoin	40 g.
Perfume	10 g.

No. 3

Grind:

Lanolin, Pure, Pale	50 g.
Coconut Oil	25 g.
Borax	8 g.
Neutral Soap Powder	25 g.
Water	80 g.
Rose Water	400 cc.
Orange Flower Water (Tepid)	400 cc.
Peppermint Oil	2 cc.

Astringent After Shaving Milk

Formula No. 1

Glyceryl Monostearate	10 g.
Vegetable Oils	8 g.
White Paraffin Oil, Odorless	2 g.
Distilled Water	73 g.
Acetic Acid (50%)	5 g.
Glycerin (28° Bé.)	2 g.

Add perfume resistant to acids.

No. 2

Camphor	2 g.
Eau de Cologne Oil	4 g.
Alcohol	300 g.
Glycerin (28° Bé.)	80 g.
Rose Water	614 g.

Transparent Liquid Shaving Soap

Olein, Clear, Pale	13.5 g.
Coconut Oil	1.575 g.
Caustic Potash (50%)	about 6.33 g.
Distilled Water (or Softened Water)	79 g.

Shaving Soap, Liquid

Olein, Light	9 g.
Coconut Oil, Cochin	3 g.
Caustic Potash (50° Bé.)	5.3 g.
Alcohol	1 g.
Glycerin, C.P.	8 g.
Water	73 g.
Rose Water	1 g.

Shaving Soap, Similar to "Rasibloc"

a.	Stearin	100 g.
	Glycerin	5 g.
b.	Caustic Potash (39° Bé.)	40.2 g.
	Caustic Soda (37° Bé.)	11.4 g.
c.	Coconut Soap	30 g.

Warm each portion and mix together in above order.

After Shave Lotion

Alcohol (95%)	680 g.
Perfume Oil	6 g.
Glycerin	15 g.
Tannic Acid	5 g.
Distilled Water	294 g.

To the alcohol perfume-solution add glycerin, then the water-tannic acid solution.

POWDERED HAND TOILET SOAPS

Formula:	No. 1 Bathroom Travel and Home Use	No. 2 Factory and Garage Use	No. 3 Office and Dispenser General	No. 4
Dry Yellow Powdered Soap, 92% plus c.p.s.,* S.N.† to be over 210 titre,‡ 25 to 35° C.	75 lb.	——	40 lb.	60 lb.
Cocoanut soap-powder, 30% Anhydrous Soap Contents, S.N. to be over 210 titre, 30 to 35° C.	——	60 lb.	25 lb.	20 lb.
Wyo-Jel No. 719 (Colloidal Bentonite), 200 mesh	24 lb.	33 lb.	30 lb.	20 lb.
Tri-Sodium Phosphate, tech. grade powdered	1 lb.	7 lb.	5 lb.	——
Perfume				
Citrene	0.2 lb.	——	——	——
Girella	——	——	0.1 lb.	0.1 lb.
Camphory Sassafras Oil	——	0.7 lb.	——	——

* c.p.s. = Chemically Pure Soap.
† S.N. = Saponification Number.
‡ Titre = Melting Point of Fats.

The ingredients are weighed into a clean and dry mixer and intensely mixed for 15 to 20 minutes. The perfume should be sprayed or sprinkled over the powdered soap or soap-powder to avoid caking. As none of the ingredients are hygroscopic it is not necessary to pack the finished product air tight.

For starting production, a clean open-head steel drum rolled and shaken on the floor is satisfactory for mixing, providing some wooden weights are laid inside to assure agitation. However, for big scale production, use one big horizontal mixer, 2000 lb. capacity, cylinder driven from both end countershafts and equipped with a double action agitator which moves toward the 6″ x 8″ outlet in the middle and which is driven by a 15 h.p. motor. A slip ring motor, or a compensator allows this mixer to be started with a full load, thus avoiding accidents and dusting.

The most ideal process to make powdered hand toilet soaps is by making them wet-processed, and if other soaps are also manufactured, it is easy and much more preferable to do so. In the case of Formula 1, the Wyo-Jel is crutched into the hot molten soap stock before cooling and drying and the perfume is added immediately before grinding down of the dried soap flakes. In case of Nos. 2 and 3, paste soap, regular soap-powder is hot mixed with all the ingredients added at once to a bakery-type dough mixer. In case of hot processing much more Wyo-Jel can be used and the final structure will be more uniform and much harder to duplicate.

Liquid Soaps (French)

Formula No. 1

Olive Oil Soap:

a.	Caustic Potash (Solid)	227 kg.
	Water	minimum possible for solution
b.	Olive Oil	182 kg.
	Palm Oil	362 kg.
	Coconut Oil	362 kg.

Heat to 49° C., add to *a*.

c.	Alcohol	170 l.

Boil the whole under reflux (82° C.). When saponified, cool, and add

d.	Water	5.6 l.

No. 2

Coconut Oil Soap

a.	Soda Ash	1 kg.
	Water	10 l.
b.	Wood Ashes	15 kg.
	Water	10 l.

Extract through a tin can with holes, pouring through water 3 to 5 times.

c.	Caustic Soda	50 %

1. Boil 10 to 15 min.:

a.	1 part by volume
b.	4 parts by volume
c.	6 parts by volume
Add Coconut Oil	10 parts by volume

during the boiling in small parts, stir slowly. Then diminish heat, stir continuously, take off, stir, then pour into wooden forms.

2. Or: Boil 10–15 minutes:

b.	4 parts by volume
c.	6 parts by volume
Sodium Sulphate (10%)	1 part by volume
Salt	½ part by volume
Add:	
Coconut Oil	9 parts by volume
and after:	
Tallow	1 part by volume

Method as in No. 1. Gentle boiling, thorough stirring, dry.

No. 3

Liquid Coconut Oil Soap

a.	Water	20 l.
	Caustic Potash (Solid)	6 kg.

Add *a* to

b.	Coconut Oil (49° C.)	20 kg.
c.	Alcohol	2.5 l.

Warm the whole to 82° C. under reflux as in 1. Let cool 24 hours, then add:

d.	Water	80 l.
	Sugar	very little
	Potassium Chloride	very little
	Glycerin	optional

No. 4

Liquid Glycerin Soap

Soft Soap, Good	35 g.
Glycerin	21 g.
Water	7 g.
Alcohol	14 g.
Talc or Pumice	5 g.

Let stand for several days; take care to eliminate excessive alkali by adding oleic acid. Filter.

Transparent Glycerin Soaps

	Formula No. 1	No. 2	No. 3
Coconut Oil, Cochin	20	26	30 kg.
Tallow	18	24	20 kg.
Castor Oil	12	10	15 kg.
Caustic Potash, 40° Bé.	25	—	— kg.
36° Bé.	—	32	— kg.
39° Bé.	—	—	35 kg.
Glycerin	10	13	10 kg.
Sugar	10	40	42 kg.
Water (60° C.)	15	30	38 kg.
"Fillers"	—	30	35 kg.

To this soap-base add *distilled water* in small portions to about 15 (kg.), and to the resulting clear, but very soft, soap add a *hardening solution* (of 15° Bé.), made up of:

Potassium Carbonate	1 kg.
Sal Soda	1 kg.
Salt	1 kg.

Add water to get 15° Bé. Warm to 75° C.

Add enough to get samples of sufficiently hard soap. Let stand covered for an hour, and test result.

Should not be of too high viscosity when spread on a glass-sheet. If too viscous or too foamy add water.

Add perfume at 50° C., sift in dye, stir and pour into molds.

Transparent Soap (Without Glycerin)

Tallow, Cochin	24 kg.
Coconut Oil	24 kg.
Castor Oil	16 kg.

Heat to 50–60° C.

Add in thin jet:

Caustic Soda (39° Bé.) 33 kg.

Stir until soap swims on top, then cover. Stir slowly over water bath. Add

Alcohol 1–2 kg.

then

Water (60° C.)	22 kg.
Sugar	20 kg.

Again

Alcohol 18–19 kg.

Cover. Keep at 75° C. for an hour. Soap should be dark and clear; foam light. Soap should remain "knife-thick" on a glass-sheet.

If opaque, try (before in test-tube) to add slowly hot water, or caustic soda (20° Bé.).

At 50–60° C. add perfume and the last 3–4 kg. of above alcohol.

Rose Soap

a.	White Tallow Soap	10,000 g.
	Cinnabar, Moistened	60–80 g.
b.	Rose Essence	25 g.
	Geranium Essence	60 g.
	Clove Essence	15 g.
	Chinese Cinnamon Essence	10 g.

Palm Soap

a.	Pure Palm Soap	5000 g.
	Half Palm Soap	5000 g.
b.	Bergamot Essence	60 g.
	Chinese Cinnamon Essence	25 g.
	Clove Essence	15 g.
	Essence of Fine Lavender	30 g.

Althaea (Marshmallow) Soap

a.	White Tallow Soap	5000 g.
	Pure Palm Soap	5000 g.
b.	Yellow Ochre	30 g.
	Paris Red	30 g.
c.	Essence of Fine Lavender	15 g.
	Essence of Pressed Lemon Peel	16 g.
	Essence of Neroli Petitgrain	16 g.
	Essence of Verbena	10 g.
	Essence of English Mint	3 g.

Bouquet Soap

a.	Soap, White Tallow	10,000 g.
	Brown Ochre	100 g.
b.	Essence of Bergamot	80 g.
	Essence of Cloves	15 g.
	Essence of Neroli	15 g.
	Essence of Sassafras	10 g.
	Essence of Thyme	10 g.

or also:

b.	Essence of Fine Lavender	20 g.
	Essence of English Mint	20 g.
	Essence of Pressed Lemon Peel	25 g.
	Essence of Sage	20 g.
	Essence of Thyme	10 g.

The following Soaps using Lauryl Sulphonates are covered by German Patents.

I. True Lemon Soap

Citric Acid	5 g.
Sodium Citrate	1 g.
Lanolin-Vaseline Oil (2 : 1, 1 : 1)	5 g.
Vegetable Lecithin	2 g.
Glycerin	2 g.
Lauryl Sulphonate	85 g.

II. Liquid Tar Soap

Wood Tar (10%)	3 g.
Glycerin	5 g.
Triethanolamine Lauryl Sulphonate	92 g.

III. Alum Soap

Aluminum Sulphate	5 g.
Lorol Sulphate or Triethanolamine Lauryl Sulphonate	95 g.

IV. Iodine Soap

Iodine-Alcohol Solution	5 g.
Glycerin	10 g.
Triethanolamine Lauryl Sulphonate	85 g.

V. Chlorthymol Soap

Chlorothymol	1 g.
Acetic Acid, Concentrated	0.5 g.
Alcohol	3.5 g.
Triethanolamine Lauryl Sulphonate	95 g.

VI. Chlorine Soap

Chloramin	1–2 g.
Lanolin-Paraffin Oil (1 : 1)	5 g.
Glycerin	3 g.
Sodium-Lauryl Sulphonate	90 g.

Soap for Removing Scarred Skin

Liquid Paraffin	70 cc.
Medicated Soap, Powdered	70 g.
Sodium Peroxide	2½ up to 10 g.

POWDER FORMULAE

	Rice Starch	Talcum	Colloidal Kaolin	Magnesium Carbonate	Magnesium Stearate	Zinc Oxide	Cold Cream	Other Additions
Face Powder:								
	600	200	...	100	40	60	...	
	450	300	...	50	...	220	...	
	500	300	...	25	...	150	...	70 Titanium Dioxide
	500	300	100	250	5	...	...	
Body Powder:								
	...	900	...	...	...	90	...	10 Salicylic Acid
	...	800	...	70	20	10	...	100 Boric Acid
	70	850	...	...	...	...	...	60 Boric Acid
	80	490	300	...	100	...	...	
Infant Powder								
	...	1000	...	...	...	...	6	1 Lanolin
Foot Powder:								
	...	850	...	...	...	100	...	10 Salicylic Acid 20 Boric Acid
	...	800	...	...	...	200	...	100 Boric Acid
	...	750	...	...	...	200	...	350 Kieselguhr
	...	600	...	...	...	...	...	10 Thymol 0.1 Formaldehyde

Dusting Powders

Formula No. 1

Phenol	1 g.
Camphor	3 g.
Exsiccated Alum	96 g.

No. 2

Salicylic Acid	4 g.
Boric Acid	5 g.
Starch	16 g.
Purified Talc	60 g.

No. 3

Salicylic Acid	10 g.
Bismuth Subnitrate	15 g.
Zinc Stearate	10 g.

No. 4

Salicylic Acid	2 g.
Tannoform	13 g.
Talcum	15 g.

No. 5

Salicylic Acid	2 g.
Tannic Acid	5 g.
Orris Root	33 g.
Alum	60 g.

No. 6

Bismuth Subgallate	5 g.
Boric Acid	15 g.

No. 7

Bismuth Subnitrate	20 g.
Starch	10 g.
Purified Talc	70 g.

No. 8

Mercuric Chloride	0.06 g.
Sodium Salicylate	26 g.
Prepared Chalk	4 g.

Thiosulphate Dusting Powder

Sodium Thiosulphate	6 g.
Boric Acid	24 g.

Dusting powder (prophylactic) for ringworm.

Foaming Bath Powder

Sodium Acid Carbonate	40 g.
Starch, Wheat	50 g.
Sodium Carbonate	10 g.

Tartaric Acid	30 g.
Kaolin, Colloidal	20 g.
Soap Powder, Concentrated	45 g.
Saponin	5 g.

Keep completely dry and sealed from air to avoid decomposition. 1–2% perfume (Lavender, Pine Needle, Eau de Cologne, Fancy), is added.

Mentholated Talcum

Menthol	0.25 g.
Alcohol	5 cc.
Talcum	50 g.

Dust freely on itching part.

"Prickly Heat" Powder

Starch	12½ lb.
Talc	7 lb.
Zinc Stearate	½ lb.
Camphor	2 oz.
Zinc Oxide	5 lb.
Menthol	1 oz.

Tooth Paste

Soap Powder	2500 g.
Calcium Carbonate	500 g.
Lactose	150 g.
Glycerin (28° Bé.)	2000 g.
Water	400 g.
Peppermint Oil	100 g.
Alcohol	100 g.
Carmine	10–20 g.

Tooth Paste with Low Glycerin Content

Calcium Carbonate, Precipitated, Medium Density	45 g.
White Clay (Bolus Alba)	5 g.
Soap Powder (85–88%), Pale, no Odor or Taste	10 g.
Water	20 g.
Glycerin, C.P.	20 g.

Tooth Paste (Without Glycerin)

a.	White Clay (Bolus Alba)	30 g.
	Calcium Carbonate, Precipitated	15 g.
	Soap Powder (as Above)	4 g.
b.	Tragacanth Paste (1%)	until pasty

Tooth Paste

Calcium Carbonate, Precipitated	50 g.
White Bolus	10 g.
Glycerin (sp. gr. 1.24, 30° Bé.)	20 g.
Water	18 g.
Tragacanth	1 g.
Perfume (as below)	
Peppermint Oil	50 cc.
Menthol	5 cc.
Anise Oil	25 cc.
Clove Oil	5 cc.
Fennel Oil	5 cc.
Ceylon Cinnamon Oil	1 cc.
Lemon Oil	1 cc.

Oxygen Tooth Paste

Calcium Carbonate, Precipitated, Medium Density	40 g.
Glycerin, C.P.	30 g.
Hard Fat Soap Powder	7 g.
Water	until soft paste

To 100 parts of this paste, add:

Sodium Perborate	10–15 g.
Perfume	1 g.

Talc Tooth Paste

Purified Talc	42 lb.
Magnesium Carbonate	8 lb.
Phenol	½ lb.
Tragacanth	6 oz.
Oil of Orange	2½ dram
Oil of Lemon	5 oz.
Oil of Anise	1 dram
Oil of Peppermint	6 oz.
Menthol	5 oz.
Glycerin	6 gal.

Salt Tooth Paste

U. S. Patent 1,968,858

Glycerin, C.P.	37½ lb.
Neutral Soap	1½ lb.
Gum Tragacanth	1½ lb.
Magnesium Carbonate (Finely Divided)	13 lb.
Calcium Carbonate (Finely Divided)	51½ lb.
Milk of Magnesia (Magnesium Hydroxide)	31 lb.
Distilled Water	24 pt.
Saccharin Powder	282 gr.
Salt (Finely Divided)	108 lb.

Flavor

Menthol Crystals	2⅔ oz.
Oil of Peppermint, U.S.P.	8 oz.
Oil of Anise, U.S.P.	⅔ oz.
Methyl Salicylate	⅔ oz.
*Flavor Compound No. 04595	12 oz.

* Flavor Compound No. 04595 is comprised as follows:

Twice Rectified Oil of Peppermint	274 oz
Oil of Eucalyptol	90 oz.
Oil of Wintergreen	45 oz.
Rectified Aniseed Oil	22½ oz.
Safrol	22½ oz.

The glycerin, water, soap, gum tragacanth, milk of magnesia, and saccharin are mixed with a rapid mixer.

Then flavor is added, which should be made a few days in advance, and after

15 minutes of mixing the product is transferred to a small mixer, the salt is added, the mixer is run for five minutes more, then the magnesium carbonate is added, followed by another five minutes' run, after which the calcium carbonate is fed to the pasty mass, and, after this has been taken up, the batch is run for 20 minutes more.

The finished mass is allowed to stand for 12 hours, and, after stirring slowly for 10 minutes before filling, the mass is filled into ordinary collapsible tubes.

Denture (Artificial Teeth) Cleaner

Glycerite of Starch	36 g.
Diglycol Laurate	1 g.
Sugar Syrup	2.25 g.
Magnesium Carbonate	1.13 g.
Gum Tragacanth	.07 g.
Precipitated Chalk	41 g.
Sodium Bicarbonate	6 g.
Water	10.5 g.
Flavor	to suit

Denture (Artificial Teeth) Adherent

Gum Karaya	80 g.
Gum Arabic	20 g.

Dental Impression Material
British Patent 399,842

Copal	26 g.
Stearic Acid	21 g.
Shellac	5 g.

Melt together and then add while heating and stirring:

Talc	48 g.
Iron Oxide, Red	¼ g.

Temporary Dental Filling

Zinc Oxide	85 g.
Rosin, Powdered	15 g.
Oil of Cloves	60 g.
Canada Balsam	35 g.
Peru Balsam	5 g.

Dental Canal Cement

Thymol	1 g.
Rosin	9 g.
Chloroform	150 g.

Dental Pulp Capping

Make a paste of zinc oxide and eugenol.

Dental Pulp Devitalizer

Make a paste of arsenic trioxide and eugenol

Antiseptic Mouth Wash
("Listerine" Type)

Boric Acid	50 g.
Benzoic Acid	1 g.
Thymol	1 g.
Eucalyptol	0.125 cc.
Oil of Peppermint	0.5 cc.
Oil of Wintergreen	0.25 cc.
Oil of Thyme	0.1 cc.
Grain Alcohol	250 cc.
Water to make up to	1000 cc.
Caramel	to color

The boric acid is dissolved in the water or about 700 cc. of same. All the other products are dissolved in the alcohol and the two solutions mixed and colored to a very pale straw. The above product must be labeled 25% grain alcohol.

Mouth Wash Tablets

Peppermint Oil	30 cc.
Saponin, Best	100 g.
Sodium Benzoate	500 g.

Mouth Rinse

Salt	30 g.
Sugar	20 g.
Oil of Cinnamon	¼ cc.
Oil of Cloves	½ cc.
Oil of Peppermint	¼ cc.

Gingivitis Mouth Wash

Boric Acid	4 g.
Potassium Chlorate	8 g.
Peppermint Water	350 cc.

Breath Deodorant

Dissolve one 4.6 grain tablet chloramine in 1 oz. water. Brush teeth and tongue, and rinse out mouth with this solution, while fresh.

Immediately and permanently rids breath of even such odors as those of garlic and onions.

Depilatory
German Patent 601,078

Barium Sulphide	100 oz.
Starch	60 oz.
Magnesium Silicate	30 oz.
Pyrogallol	10 oz.

Make into a paste with water before using.

Odorless Depilatory

Perhydrol	3.5–5 g.
Polychol (or Polyglycol)	5 g.
Lanolin Anhydrous	20 g.

Rub together till uniform.

Adhesive Depilatory
U. S. Patent 2,013,928

Rosin	90 g.
Cottonseed Oil	10 g.

Warm together and stir until uniform.

Sun Burn—Protectors
Liquid

a. Triethanolamine	40 g.
Trihydroxyethylamine Stearate	40 g.

Melt on water bath, make emulsion in

Water (60° C.)	620–630 g.
b. Paraffin Oil	100 g.
Peanut Oil	150 g.
Oleic Acid	30 g.

Warm up on water bath to 40° C.

Methyl-*p*-Hydroxy Benzoate	1 g.

Pour *b* into *a*, perfume with

c. Perfume Oil	to suit

Stir until cold.

Cream

White Wax	60 g.
Cocoa Butter	30 g.
Lanolin, Anhydrous	40 g.
Peanut Oil	300 g.
Spermaceti	20 g.
Moldex or Other Preservative	1 g.
Perfume	5–10 g.

Preventatives against Sunburn

a. Gum Tragacanth (Powder)	15 g.
Glycerin	50 g.

Grind in mortar.

b. Quinine Acid Sulphate	100 g.
Citric Acid	100 g.
Water	1200 g.
Alcohol (95%) with Perfume	400 g.
c. Glycerin	150 g.

Grind *a*, then add the *b* solution, and finally add *c*.

Sunburn Protecting Cream

a. Quinine Hydrochloride	4 g.
Alcohol (95%)	12 g.
b. Citric Acid	0.8 g.
Water	10 g.
c. Tragacanth Powder	3.5 g.
Glycerin	10 g.
Water	42.5 g.

Mix solutions *a* and *b* and then work into solution *c*.

Perfume Composition, with Fresh Perfume Odor	9 drops

Sunburn-Protecting Oil

Quinine Oleate, C.P.	3–5 g.
Paraffin Oil	27 cc.
Fatty Oil	70–68 cc.
Dye (Oil-Soluble Red)	

Sunburn-Protecting Oil

Quinine Ricinoleate	3–5 g.
Olive Oil	97–95 cc.

Sunburn (Suntan) Oil

Mix

Vaseline Oil	75 g.
Sesame or Peanut Oil, Pale	23 g.
Thymol	0.5 g.
Lanolin, Anhydrous	1.5 g.
Perfume	1–2 g.

Made up of:

Pine Oil	3 cc.
Lavender Oil	1 cc.
Rosemary Oil	1 cc.
Laurel Oil	3–5 cc.

Suntan Oil

Paraffin Oil	20 cc.
Fatty Oils, Free from Acid, Preserved	80 cc.
Etheric Oils (Bergamot, Eau de Cologne [free from Methylanthranilic Ester] or Pine Needle Oil)	1 cc.

Dye with Chlorophyll, Oil-soluble.

Preparations to Protect Feet Against Hurting and Inflammation
Foot Creams

Formula No. 1

Potash Soap	50 g.
Yellow Vaseline	15 g.
Water	29 g.
Zinc Oxide	6 g.
Caustic Soda	11 drops

No. 2

Potash Soap	52 g.
Vaseline	15 g.
Water	27 g.
Zinc Oxide	6 g.

No. 3

Soap	35 g.
Vaseline	15 g.
Water	45 g.
Zinc Oxide	5 g.
Lavender Oil	to suit

No. 4

Lamb Tallow	100 g.
Pig Fat	100 g.
Creosote	1 g.
Juniper Oil	10 g.

No. 5

Wool Fat	20 g.
Vaseline	10 g.
Formalin	10 g.

No. 6

Glyceryl Monostearate	20 g.
Glycerin	5 g.
Paraffin Oil	5 g.
Formaldehyde Solution	15 cc.
Water	55 cc.

Melt up to 60° C. Stir until cold.

Peeling Paste for Corns or Hard Skin

(Not to be put on normal skin, as it is irritating).

Formula No. 1

Lard	50 g.
Salicylic Acid, U.S.P.	50 g.

No. 2

Salicylic Acid, C.P.	30 g.
Vaseline, White	70 g.

No. 3

Mild-acting paste (stir warm):

a.	Pine Resin, Pure	8 g.	Melt
	Wax, Yellow	30 g.	Melt
	Larch Turpentine	12 g.	
	Vaseline, Yellow	16 g.	
b.	Salicylic Acid	8 g.	
	Anaesthesin	3 g.	
	Peanut Oil	14.5 g.	

Mix warm, stir until clear solution; cool stirring; when thickening starts, add

Methyl Salicylate	0.5 g.
Peru Balsam	8 g.

Stir until cold.

Athlete's Foot Ointment

Salicylic Acid	8 oz.
Ammoniated Mercury	4 oz.
Bismuth Subnitrate	12 oz.
Oil of Eucalyptus	12 oz.
Hydrous Wool Fat	64 oz.

Mix and make into an ointment.

Athlete's Foot Powder

Sodium Thiosulphate	20 oz.
Boric Acid	50 oz.
Purified Talc (Sterilized)	30 oz.

Triturate thoroughly. This may be used as a prophylactic powder applied to the feet and dusted in the shoes.

Athlete's Foot Treatment

Immerse feet two or three times a day in a warm saturated aqueous solution of furfural. Always have a little free furfural floating around to make sure of an excess. Continue treatment until all signs of the disease disappear. Then treat feet once a day for several weeks to prevent recurrence. Shoes and socks should also be treated with this solution to disinfect them.

"Athlete's Foot" Remedy

Gentian Violet	1 part
Alcohol	100 parts
Water	100 parts

Stir until dissolved.

Bunion Remover

Salicylic Acid	6 g.
Lanolin	60 g.

Soak foot in hot water; cut off thick skin and apply twice a day.

Pilocarpine Eye Drops

Pilocarpine Nitrate	0.1 g.
Boric Acid	0.2 g.
Distilled Water	to make 10 cc.

Label: Drop into eye from one to five times daily (in chronic glaucoma).

Pilocarpine Eye Salve

Pilocarpine Nitrate	0.2 g.
Distilled Water	1 cc.
Hydrous Wool Fat	2 g.
White Petrolatum	7 g.

Mix with careful trituration and dispense in collapsible tube with eye tip.

Label: Apply to affected eye at bedtime (in chronic glaucoma). If collapsible eye ointment tube is not available, a glass rod may be used to apply salve to lower lid, which is then permitted to close. Gentle massage of lids helps to distribute ointment over the conjunctiva.

Eye Ointment

Silver Nitrate	0.5 g.
Distilled Water	1 g.
Cocoa Butter	15 g.
Liquid Paraffin	equal parts to 100 g.
Soft Paraffin	equal parts to 100 g.

Cetyl Alcohol

U. S. Patent 2,021,926

Formula No. 1

241 parts of spermaceti are melted and heated to 200° C. 42 parts of powdered potassium hydroxide are now added with agitation in half an hour, during which time the temperature is allowed to rise to 240° C. It is held at this temperature for half an hour when superheated steam

is passed in. There distils over with the steam a colorless oil which sets on cooling to a crystalline waxy solid which is entirely free from fatty acid and from unsaponified spermaceti. The yield is approximately 100 parts by weight, the proportion of water to oil in the distillate being approximately 10:1.

No. 2

241 parts of spermaceti are treated as in Example 1 with a mixture of 21 parts powdered potassium hydroxide and 15 parts of powdered sodium hydroxide. After reaction, the molten mixture of soaps and fatty alcohol is subjected to superheated steam distillation at about 250° C., eventually at 280° C. until no more oil distils. The yield is approximately 100 parts of the pure alcohol from spermaceti, the ratio of water to oil in the distillate being approximately 10:1.

No. 3

268 parts of sperm oil are treated as in Example 1 with a mixture of 21 parts of caustic potash and 15 parts of caustic soda. After reaction the mass is subjected to superheated steam distillation until no more oil distils. The yield is 90 parts of a semi-solid alcohol, free from unsaponified wax or free fatty acid. The ratio of water to oil in the distillate is approximately 4:1.

Arthritis Ointment

Ichthyol	20 g.
Lanolin	30 g.

Rub together until uniform; apply freely to joint and apply bandage.

Frostbite Ointment

Ichthyol	3 g.
Lanolin	4 g.
Camphor	2 g.
Petrolatum	60 g.

Warm and stir until dissolved. Rub into skin and bandage.

Analgesic Balm

Menthol	5 oz.
Methyl Salicylate	10 oz.
Hydrous Wool Fat	75 oz.
White Petrolatum	10 oz.

Burn Ointment

Tannic Acid	2 g.
Ichthyol	33 g.
Lanolin	62 g.

Carbuncle Ointment

Ichthyol	25 g.
Lanolin	35 g.
Zinc Oxide Ointment	90 g.

Apply thickly daily.

Chapped Skin Ointment

Phenyl Salicylate	8 g.
Menthol	4 g.
Olive Oil	40 cc.
Lanolin	125 g.

Warm together and mix until dissolved.

Glycerin-Sulphur-Kaolin-Acne Paste

Kaolin	10 g.
Sulphur, Colloidal	7.5 g.
Glycerin (24%)	to pasty consistency

Boil Ointment

Ichthyol	15 g.
Lanolin	68 g.

Apply thickly on gauze and hold in place with adhesive.

Ringworm Ointments

Sulphur Ointment

Precipitated Sulphur	1.5 g.
Petrolatum	30 g.

Rub in gently once or twice daily. Strength may gradually be increased up to 20 per cent.

Compound Benzoic Acid Ointment

Salicylic Acid	1 g.
Benzoic Acid	2 g.
Ointment of Rose Water	30 g.

Apply locally twice daily. Strength may be doubled, if necessary.

Chrysarobin Ointment

Chrysarobin	1.5 g.
Petrolatum	30 g.

Apply with care against getting it in the eyes.

Salicylic Acid Pigment

Salicylic Acid	1.5 g.
Chloroform	30 cc.

Paint on affected area twice daily until desquamation occurs.

Pyrethrum Ointment

Pyrethrum Extract	27 g.
Absorption Base (Parachol)	73 g.

Mix until smooth. Useful in treating scabies and other insect infestations.

Ulcer Salve

Ethyl Aminobenzoate	3 g.
Paraffin	10 g.
Petrolatum	20 g.

Spread on gauze and apply to ulcer.

Protecting Skin Against Mustard Gas

Glycerin impregnated coarse fibered clothing is recommended. This protection lasts for at least two hours' exposure to this gas.

A. B. C. Liniment

Tincture of Aconite	30 cc.
Fluidextract of Belladonna	30 cc.
Chloroform	30 cc.
Soap Liniment	to make 240 cc.

Analgesic liniment. For external use only.

Glycerin-Sulphur Liniment

Potassium Carbonate	20 g.
Glycerin	20 g.
Sulphur, Precipitated (Grind together)	20 g.
Alcohol (68%)	20 g.
Ether	20 g.

"Penetrating" Liniment

Oil of Turpentine	1 gal.
Oil of Sassafras	1 lb.
Oil of Cajaput	1 lb.
Chloroform	½ gal.
Oil of Camphor	¼ gal.
Oleoresin Capsicum	5 oz.
Coal Oil	3 gal.

Rheumatism Liniment

Camphor	1 lb.
Chloroform	32 fl. oz.
Alcohol	80 fl. oz.
Methyl Salicylate	16 fl. oz.

Dissolve camphor in the mixture of the other ingredients. Excellent for sore or aching muscles. Should be applied at night by rubbing in.

Back Rub Ointment

Zinc Stearate	5 g.
Tincture of Benzoin	5 g.
Scarlet Red Ointment (5%)	0.25 g.
Hydrous Wool Fat	30 g.
Liniment of Camphor	180 cc.
Mutton Tallow	500 g.

Non-Staining (Non-Leaking) Mineral Oil Laxative

White Soft Paraffin Wax	2 oz.
Mineral Oil, U.S.P.	6 oz.

Warm together and stir until uniform.

Castor Oil Candy Laxative
U. S. Patent 1,991,139

Predetermined quantities of broken chocolate and castor oil are heated in separate containers or kettles before mixing. The chocolate is heated to approximately 115° F., while being thoroughly stirred or agitated, and is then permitted to cool to approximately 85° F., which temperature is finally slowly increased to between 88 and 90° F.

After the chocolate melting operation has been commenced, or simultaneously with this operation, an amount of castor oil approximately that of the melted chocolate, is slowly heated to between 85 and 90° F., preferably between 88 and 90° F. The heating of the castor oil and chocolate is so timed that the temperature of the one will coincide with that of the other. The best mixing temperature is between 88 and 90° F., it being essential that the temperature of each ingredient be kept exactly the same.

Mixing of the melted chocolate and heated castor oil is effected at this stage by drawing off the two ingredients from their separate kettles into a mixer, where they are thoroughly beaten and blended, after which the temperature is lowered to between 75 and 80° F. At this point, the mixture is cast into centers or chocolate shells which are subsequently capped with chocolate and run into a cold box for final cooling.

Agar Mineral Oil Emulsion

Mineral Oil	18¾ gal.
Emulsone B or Gum Tragacanth	8¾ lb.
Powdered Agar	1 lb.
Citric Acid	2 oz.

Some sodium benzoate and aseptoform as preservative, and a small amount of vanillin and saccharin for flavoring purposes.

Emulsion of Liquid Petrolatum

Liquid Petrolatum	500 cc.
Acacia, in Very Fine Powder	125 g.
Syrup	100 cc.
Vanillin	0.035 g.
Alcohol	60 cc.
Distilled Water, a sufficient quantity to make	1000 cc.

Mix the liquid petrolatum with the powdered acacia in a dry mortar, add 250 cc. of distilled water all at once and emulsify the mixture. Then add, in divided portions and triturating after each addition, a mixture of the syrup, 50 cc.

of distilled water and the vanillin, dissolved in the alcohol. Finally add sufficient distilled water to make the product measure 1000 cc.

Note: In preparing Emulsion of Liquid Petrolatum other methods of emulsification may be used and the quantity of acacia may be reduced or it may be replaced by agar, gelatin, tragacanth or mixtures of any of these emulsifying agents, provided the resulting emulsion is similar in viscosity and appearance to the emulsion made by the formula suggested above.

Antipyrine Suppositories

Antipyrine	3	g.
Extract of Belladonna	0.1	cc.
Cacao Butter	20	g.

Mix and divide into ten suppositories.

Label: One every two to four hours as required.

Psoriasis Treatment

Formula No. 1

Salicylic Acid	10	g.
Oil of Cade	25	cc.
Soft Soap	25	g.
Alcohol	to make 100	cc.

Paint over patches, permit to dry, and wash off excess in bath.

No. 2

Salicylic Acid	10	g.
Chrysarobin	20	cc.
Oil of Cade	20	cc.
Soft Soap	25	g.
Petrolatum	25	g.

Label: Apply to patches.

Acidosis Preventative

To a teaspoonful of sodium bicarbonate in a deep bowl, add the juice from one lemon. Stir until effervescence is completed, and add a glass of cold water, and drink. Best results are obtained by taking this drink upon rising in the morning, at least one-half hour before breakfast.

Cold and Gripppe "Remedy"

The following has been used with splendid success by members of a technical manufacturing organization:

a. Acetic Acid (36%), U.S.P.	⅓	fl. oz.
Water	to make 1	fl. oz.
b. Ammonium Carbonate, U.S.P.	48	gr.
Water	to make 1	fl. oz.
c. Sodium Bicarbonate	2	d.
Potassium Citrate	2	d.
Aromatic Spirits of Ammonia	1	fl. oz.
Water	1	fl. oz.

Mix *a* and *b*; after effervescence stops add *c*.

Take one teaspoonful every 2 hours.

Hay Fever Remedies

Formula No. 1

Ephedrine (Dried)	0.1	g.
Petrolatum, Liquid	10	cc.

Use as nasal spray.

No. 2

Ephedrine Sulphate	1	g.
Calcium Lactate	4	g.

Place in No. XXX capsules; use one 3 or 4 times daily.

Sea-Sickness Remedy

Antipyrin	4	g.
Sodium Bromide	8	g.
Sugar	2	g.

Use once every three hours.

Appetite Stimulant

Tincture of Capsicum	2	cc.
Tincture of Nux Vomica	16	cc.
Tincture of Gentian Compound	72	cc.

Dose: Three teaspoonfuls daily.

Bronchitis Inhalant

Menthol	½	g.
Chloroform	4	cc.
Tincture of Benzoin	120	cc.

Inhale twice daily, using one teaspoonful to pint of boiling water.

Menthol Inhalator

Eucalyptus Oil	4	cc.
Menthol	2	g.
Paraffin Oil	94	cc.

Laryngitis Spray

Thymol	0.15	g.
Menthol	1.2	g.
Eucalyptus Oil	3	g.
Petrolatum, Liquid	300	cc.

Tonsilitis Gargle

Potassium Chlorate	8	g.
Tincture Ferric Chloride	12	cc.
Glycerin	60	cc.
Water	240	cc.

Stomach Gas Relief

Calomel	3 g.
Bicarbonate of Soda	5 g.
Lactose	4 g.

Periodic Pain Alleviator

Formula No. 1

Amidopyrine	20 oz.
Alcohol	40 oz.
Simple Syrup	138 oz.
Flavor	to suit

No. 2

Starch	90 oz.
Amidopyrine	90 oz.
Acetyl Salicylic Acid	25 oz.

Camphor Tablets (Pharmaceutical)

Camphor	5 g.
Sugar	50 g.
Peppermint Oil	2–2.5 cc.

Pack tight, to prevent volatilizing.

Moth Protection Tablets

Naphthalene	225 g.
Camphor	75 g.
Ceresin	50 g.

Melt together and then add

Hexachlorethane	50 g.
Pine Needle Oil	5 g.

Dip cardboards into the above while fluid.

Sterilizing Helmets and Gas Masks

The U. S. Government, in its specifications for sand blast helmets purchased by its various departments, requires that each article be capable of passing either one of the following sterilization tests:

(*a*) Immersion for ten minutes in a solution of formaldehyde made by placing one part of 40% solution of formaldehyde in nine parts of water, or

(*b*) Subjection to sterilization by a moist atmosphere of antiseptic gas, preferably formaldehyde, for a period of ten minutes, at room temperature.

It has been suggested that care should be taken to remove all the formaldehyde from the masks by washing with water before they are placed in use.

"Creolin" Disinfectant

Sulphonated Castor Oil	100 kg.
Caustic Soda (36° Bé.)	51.2 kg.

Heat above at 80–100°C., then add

Rosin	104 kg.

Mix with heating until uniform and add

Tar Oils (200–320° C.)	775 kg.

Mix until dissolved and then add

Water	to make 1000 kg.

Disinfectant for Telephones

Solution 1

Oil of Wintergreen	0.5 g.
Oil of Eucalyptus	0.25 g.
Denatured Alcohol	15 g.

Solution 2

Formaldehyde	25 cc.
Water	225 cc.

Add solution 1 to solution 2 and dilute with water to 1000 cc.

Counter Irritant, Extra Strong

Menthol	2 g.
Volatile Oil of Mustard	2 cc.
Alcohol	50 cc.

Apply a few drops to affected area. (Must not be used in the vicinity of the eyes.)

Stainless Iodine Solution

Resublimed Iodine	4 g.
Potassium Iodide	10 g.
Hyposulphite of Soda	10 g.
Alcohol, Anhydrous	200 cc.

Non-Irrititating Iodine Antiseptic

Iodine	2 g.
Potassium Iodide	2.4 g.
Alcohol	55 g.
Water	45 g.

Tattoo Mark, Removing

First the skin is vigorously rubbed until the outer epidermis comes off; then a paste of quicklime, just slacked, to which pulverized phosphorus (two tablespoonfuls to a pint) is added and thoroughly mixed, is applied to the tattooed surface and held by a bandage, which is taken off two days later. The crust is left to dry and then fall off itself; in about fifteen days. A second application should be made; a third is rarely necessary. Thus treated, the tattooing disappears completely without the least scar.

Mechanics Hand Protective Coating

U. S. Patent 2,021,131

Water	1600 oz.
Sodium Stearate	288 oz.
Glycerin	1155 oz.
Sodium Silicate	906 oz.
Lemenone	1 oz.

Volatile Anæsthetics

Formula No. 1

Methyl and Ethyl Chloride equal parts

No. 2

Ethyl Chloride	60 cc.
Methyl Chloride	35 cc.
Ethyl Bromide	5 cc.

No. 3

Methyl Chloride, Ethyl Chloride, Chloroform	equal parts

An anæsthetic for external use containing

Chloroform	½ fl. dr.
Ether	2½ fl. dr.
Liquid Paraffin	2½ fl. dr.

is employed when light anæsthesia is required in painful wound dressings or for short operations.

Anæsthesia Chloroform Preservative

Add 1% of absolute alcohol and keep in a cool place away from direct light.

X-Ray Contrast Media

1. Barium diet for stomach and intestinal examinations. Boil together

Corn Starch	15 g.
Sugar	15 g.
Cocoa	20 g.
Barium Sulphate	150 g.
Water	500 cc.

2. Barium diet for diagnosis of stenosis of the small intestine.

Barium Sulphate	80 g.
Thick Gruel	200 cc.

3. Barium suppository for rectum examination.

Corn Starch	30 g.
Water	750 to 1000 cc.

Boil together and add a suspension of

Barium Sulphate	200 g.
Water	500 cc.

Cystographic Medium

U. S. Patent 1,935,661

Five to 8 per cent aqueous solutions of sodium (or potassium) bismuth tartrate or citrate (1) serves as cystographic media opaque to X-rays; (1) should contain about 65 (70) per cent of bismuth.

Hormone Manufacture

U. S. Patent 1,978,297

The ground whole testicles are preferably macerated from 12 to 48 hours with the required amount of the solvent selected, the liquid is filtered off, the residue expressed and re-extracted with preferably the same solvent, this time (the glands having been freed from the water therein) using the exact concentration which recovers most of the hormone with the least undesired material, as, for example, 90% acetone, 70% propyl alcohol or about 75% ethyl or methyl alcohol, etc. Extraction is continued until the residue is fully extracted. The extracts are combined, and the solvent distilled off at a low temperature and under reduced pressure. All traces of the solvent are removed, leaving the lipoid material containing the hormone, together with other substances emulsified in an aqueous solution.

The mixture resulting from the agitation of the emulsified aqueous solution of the lipoid material with one of the solvents named above, when the agitation has ceased, separates into two or three layers, dependent upon the solvent used. When three layers are formed, the upper or solvent layer contains the active lipoid with possible traces of cholesterol and phospholipins, and is free from protein, the middle layer contains most of the phospholipins and cholesterol present in the original extract, together with other organic material, and a portion of the solvent and water. The lower aqueous layer contains blood pigments, salts, etc. The one or two lower layers are preferably drawn off and the agitation with the hormone solvent repeated several times and finally the two or three layers are drawn off separately. In case chloroform is used the lower chloroform layer contains the active hormones.

The combined upper layers may then be washed with a 1 to 10% sodium carbonate solution to remove all traces of the fatty acids and phospholipins, washed with water to remove the sodium carbonate and the solvent distilled off. The residue then contains the testicular hormone in a high state of purity.

For example, in using amyl alcohol at this step of the process, the agitated mixture of the amyl alcohol and the aqueous solution containing the lipoid material separates into three layers, with the upper layer containing the active portion or hormone. The two lower layers are then drawn off, the agitation with amyl alcohol repeated and the upper layers resulting from several repetitions of this step combined, washed with a 1 to 10% sodium carbonate solution and then with water and the solvent distilled off leaving the hormone in a high state of purity.

Analgesic Chaulmoogra Oil for Injection

Chaulmoogra Oil	80	cc.
Olive Oil	20	cc.
Benzyl Ephedrine Base	0.1	g.

Intravenous Colloidal Sulphur
British Patent 433,833

Sodium Sulphide, Pure	23.5	g.
Water, Distilled and Deaerated	50	cc.
Dextrin	10	g.
Dissolved in		
Water, Distilled	400	cc.
Dilute to	1	l.

Add sulphur dioxide to a pH of 7.6 and dilute with distilled water to 10 mg. of sulphur per cc.

Hydrogen Peroxide Preservative

The addition of 20 g. phenacetin to 5 kg. hydrogen peroxide acts as a good preservative.

Preservatives for Hydrogen Peroxide

According to French chemists the best preservative for hydrogen peroxide solution is phenetidine lactate in the proportion of 0.5 g. per liter of solution. Less effective are glucose, gelatin (0.2 g. per liter); ethyl alcohol (16 g. per liter); and hippuric acid (0.2%).

Embalming Fluid—For Decolorizing Jaundice Cases
U. S. Patent 1,942,407

Benzoyl Peroxide	15	g.
Ethyl Alcohol (95%)	3	gal.
Formalin (40%)	4	pt.
Water	1½	gal.

Embalming Fluid
Formula No. 1

Formalin (40%)	220	oz.
Glycerin	100	oz.
Borax	90	oz.
Sodium Chloride	10	oz.
Sodium Nitrate	10	oz.
Potassium Citrate	50	oz.
Methanol	40	oz.
Water	75	oz.
Benzaldehyde	6	oz.

Color with Erythrosine.

No. 2

Borax	4	oz.
Phenol	5	oz.
Salicylic Acid	5	oz.
Formalin (40%)	71	oz.
Glycerin	31	oz.
Water	sufficient to make 1	gal.

Corpse Wound Filler

a. Yellow Beeswax	5	oz.
Paraffin	5	oz.
White Petrolatum	15	oz.
b. Soap Flakes	2	oz.
Water	5	oz.

Finishing Cream (Corpse)

Glycol Stearate	12	oz.
Glyceryl Tristearate	5	oz.
Rose Oil	2	oz.
Glycerin	3	oz.
Water	78	oz.
Titanium Dioxide	1	oz.

Animal Embalming Fluid

Use a water solution of either 5% furfural or 10% formaldehyde.

Air Purifier

Alcohol (95%)	2000	cc.
Formalin (40%)	400	cc.
Pine Needle Oil	190	cc.
Thyme Oil	10	cc.

For use dilute with water 1:50.

Solid, Volatile Preparations to Perfume and Disinfect the Air

Formula No. 1
Naphthalene, Pure

No. 2
Paradichlorobenzol, Pure

No. 3*

Naphthalene, Scales	70	g.
Camphor, Sublimed	10	g.
Paradichlorobenzol	20	g.

No. 4

Naphthalene	80	g.
Carbolic Acid (Phenol)	20	g.

Heat the mixtures gently, very little beyond the melting point (color optionally with yellow, red, blue, oil-soluble dyestuffs) and pour into molds. Work in well ventilated rooms.

* 0.5% of Citral may be added.

Water Soluble Bactericide
U. S. Patent 1,930,474

A 1:1 mixture (200 g.) of chlorothymol and olive oil is treated with sulphuric acid (60 g.) at 20° for 2 days, and then washed free from acid with saturated aq. sodium sulphate; the product is readily dispersed in water.

Protecting Tin Collapsible Tubes Against Corrosion

U. S. Patent 1,968,722

Collapsible tubes containing soap, shaving cream, toothpaste and other alkaline materials are protected against corrosion by addition of 0.1% sodium nitrite.

Pharmaceutical Charcoal Preparations Tablets

Formula No. 1

Activated Carbon	200 g.
Gum Tragacanth	8 g.
Sugar	195 g.
Water	68 g.

No. 2

Activated Carbon	100 g.
Sugar	5 g.
Albumen Solution	5 g.
Gum Arabic	3 g.
Tincture of Benzoin	1 g.

The above are useful in the treatment of dyspepsia.

Removing Creosote from Skin and Clothing

Wash with isopropyl alcohol to remove creosote and prevent further "burning" of skin.

Zinc Ointment

White Beeswax	60 g.
Spermaceti	60 g.
Oil of Sweet Almonds	300 g.

Digest 2 hours on water bath.

Gum Benzoin, Siam	20 g.

Add while cooling.

Zinc Oxide	100 g.
Boric Acid	2 g.
Carmine	enough to color

Perfume with extract of rose leaves.

Hiccough Remedy

Take one teaspoonful of tincture of castoreum and repeat in a half hour if needed.

Fingernail Cleaner

A fingernail stain remover consists of a saturated solution of tartaric acid in water.

EMULSIONS

GASOLINE EMULSIONS

Formula No. 1

Triethanolamine	1½	cc.
Water	1	cc.
Oleic Acid	1½	cc.
Butanol	5	cc.
Gasoline	45	cc.

Dissolve triethanolamine in water and add the mixture of other ingredients slowly while stirring vigorously.*

No. 2

Triethanolamine	1 cc.
Water	1 cc.
Oleic Acid	1 cc.
Butanol	5 cc.
Gasoline	45 cc.

No. 3

Triethanolamine	½ cc.
Water	1 cc.
Oleic Acid	½ cc.
Butanol	5 cc.
Gasoline	45 cc.

No. 4

Triethanolamine	½ cc.
Oleic Acid	1 cc.
Water	1 cc.
Butanol	5 cc.
Gasoline	45 cc.

No. 5

Triethanolamine	1 cc.
Water	1 cc.
Oleic Acid	1 cc.
Butanol	2 cc.
Alcohol	4 cc.

No. 6

Triethanolamine	1 cc.
Water	1 cc.
Oleic Acid	1 cc.
Butanol	4 cc.
Alcohol	2 cc.

No. 7

Triethanolamine	1 cc.
Water	1 cc.
Oleic Acid	1 cc.
Butanol	5 cc.
Kerosene	20 cc.
Gasoline	25 cc.

No. 8

Triethanolamine	1 cc.
Water	1 cc.
Oleic Acid	1 cc.
Alcohol	3 cc.
Gasoline	45 cc.

No. 9

Triethanolamine	1 cc.
Water	1 cc.
Stearic Acid	5 cc.
Alcohol	3 cc.
Gasoline	45 cc.

No. 10

Triethanolamine	1 cc.
Water	1 cc.
Stearic Acid	3 cc.
Alcohol	3 cc.
Gasoline	45 cc.

No. 11

Triethanolamine	1 cc.
Water	1 cc.
Stearic Acid	2 cc.
Alcohol	3 cc.
Gasoline	45 cc.

No. 12

Triethanolamine	1 cc.
Water	1 cc.
Stearic Acid	3 cc.
Alcohol	2 cc.
Gasoline	45 cc.

No. 13

Triethanolamine	½ cc.
Water	1 cc.
Stearic Acid	3 cc.
Alcohol	3 cc.
Gasoline	45 cc.

No. 14

Triethanolamine	¼ cc.
Water	½ cc.
Stearic Acid	3 cc.
Alcohol	3 cc.
Gasoline	45 cc.

No. 15

Triethanolamine	¼ cc.
Water	½ cc.
Stearic Acid	2 cc.
Alcohol	2 cc.
Gasoline	45 cc.

No. 16

1% Water

Triethanolamine	175 cc.
Water	350 cc.
Stearic Acid	1400 cc.
Alcohol	1400 cc.
Gasoline	31500 cc.

No. 17

¾% Water

Triethanolamine	175 cc.
Water	260 cc.
Stearic Acid	1400 cc.
Alcohol	1400 cc.
Gasoline	31500 cc.

No. 18

½% Water

Triethanolamine	175 cc.
Water	175 cc.
Stearic Acid	1400 cc.
Alcohol	1400 cc.
Gasoline	31500 cc.

No. 19

¼% Water

Triethanolamine	175 cc.
Water	85 cc.
Stearic Acid	1400 cc.
Alcohol	1400 cc.
Gasoline	31500 cc.

No. 20

10% Water

Trihydroxyethylamine Laurate	3500 cc.
Gasoline	31500 cc.
Butanol	5600 cc.
Water	3500 cc.
Triethanolamine	1750 cc.

No. 21

5% Water

Trihydroxyethylamine Laurate	2100 cc.
Gasoline	31500 cc.
Butanol	3500 cc.
Water	1750 cc.
Triethanolamine	1050 cc.

No. 22

1% Water

Trihydroxyethylamine Linoleate	2100 cc.
Gasoline	31500 cc.
Butanol	3500 cc.
Water	700 cc.
Triethanolamine	1050 cc.

* The stability of the above emulsions is improved considerably if they are passed through a colloid mill.

Bright Drying Wax Emulsion

Paraffin Wax		15 g.
Oleic Acid		15 g.
Triethanolamine		20 g.
Borax }	previously	7½ g.
Water }	dissolved	7½ g.

Warm together to 90° C. and mix with an electric mixer. While keeping at 90–100° C. and stirring vigorously add the following which must be at 90–95° C.

Carnauba Wax	100 g.
Water	1000 cc.

Cool quickly and package.

Paraffin Wax Emulsion
Formula No. 1

Paraffin Wax	120 g.
Stearic Acid	12 g.

Melt together and while stirring vigorously add following heated to 55° C.

Ammonia (26° Bé.)	6 cc.
Water	182 cc.

Stir until uniform.

No. 2

Glyceryl Monostearate	5 g.
Water	150 cc.

Heat and stir vigorously until uniform. Pour into this slowly while stirring strongly:

Paraffin Wax (melted)	40 g.

Paraffin Wax Emulsion
(Non-Alkaline)

Paraffin Wax	25 g.
Glycol Stearate	5 g.

Melt together and while stirring vigorously add

Water (boiling)	175 cc.

Laundry Calendering Wax Emulsion

Mix 33 parts of paraffin wax with 3 parts of oleine, and pour this mixture into a solution of 0.6 part of strong ammonia in 63.4 parts of water, heated to 160° F.

Aqueous Fat-Dissolving Emulsion
German Patent 598,216

Prepare: Carragheen Moss Dispersion, warming gently in water, remove, thicken components in a centrifugal.

Acidify with oxalic acid. Mix thoroughly.

Acidified Carragheen Moss Solution	100 cc.
Phosphoric Acid (Free from Arsenic) (67%)	10 cc.
Fat Solvent	200 cc.
e.g.	
Trichloroethylene	100 cc.
Naphtha	200 cc.

Chlorinated Naphthalene Emulsion
British Patent 413,756

Eighty g. of wax-like chlorinated naphthalene, of setting point 93° C. is dissolved in 100 g. trichloroethylene, and is added with stirring to a warm mixture of water 60 g., Turkey-red oil 10 g., casein 3 g. and strong ammonium hydroxide 1 g.

Emulsions of Oils, Fats, Waxes and Resins
British Patent 431,642

Water is dispersed in oils, fats, waxes, resins, artificial resins, pitches, asphalts or the like by adding to the water, prior to or during the mixing, about 0.01% of the principal substance of aqueous alkali, such as caustic soda or potash or ammonia, having dissolved therein aromatic hydrocarbon derivatives or their salts soluble in alkali such as benzoic acid, sodium salicylate, *o*, *m* or *p*-cresol, xylenol, guaicol, or cresol, or mixtures thereof. The products may have pigments or solid substances incorporated therewith for use as paints, color varnishes, printing inks, or lubricants.

Formula No. 1

600 g. of water, containing 0.012 g. of a solution of 15% caustic soda and 1.5% of the above specified substances, are stirred at 25–30° C. into 1000 g. of linseed-oil varnish; 280 g. of the resulting water-in-oil emulsion are stirred with 530 g. of red lead and 175 g. of calcite.

No. 2

250 g. of water containing 0.02 g. of emulsifier as in (1) are stirred into a mixture of 100 g. of asphalt and 900 g. of printers' linseed-oil varnish; 9 g. of nigrosin are stirred into the product to produce a printers' ink.

No. 3

350 g. of water containing 0.015 g. of caustic soda and 0.0015 g. of sodium benzoate are stirred at 30° C. into 1000 g. of olive oil; the product may be used as salad oil.

No. 4

300 g. of water containing 0.02 g. of caustic potash and 0.02 g. of cresol are stirred into 1000 g. of viscous mineral lubricating oil and 100–200 g. of

graphite added with stirring to produce a lubricant.

Emulsions of Oils, Fats, or Waxes
German Patent 575,922

Formula No. 1

Cod Liver Oil	80	g.
Pectin	0.5	g.
Milk Sugar	20	g.
Water	20	g.

No. 2

Paraffin Oil	80	g.
Pectin	0.5	g.
Milk Sugar	20	g.
Water	20	g.

German Patent 585,586, Addition to the Above (575,922)

For stable emulsions containing up to 80% of oils use instead of Milk-Sugar:

Fruit Sugar (Fructose)
Invert Sugar (Invertose)
Grape Sugar (Glucose)
Manna Sugar (Mannose)
Never use Cane Sugar!

Pine Oil Emulsion

Pine Oil	9	g.
Diglycol Laurate	4	g.
Mineral Oil	1	g.
Water	100	g.

Mix first three materials, and then add water slowly while stirring vigorously.

Cottonseed Oil Emulsion

Diglycol Laurate	18	cc.
Cottonseed Oil	40	cc.
Water	50	cc.

China Wood Oil Emulsion

Diglycol Laurate	18	cc.
China Wood Oil	40	cc.
Water	55	cc.

Mineral Oil Emulsion Cream

Glyceryl Monostearate	5	g.
Water	125	cc.

Heat together and stir until uniform then add slowly while stirring vigorously

Mineral Oil	43	cc.

Soluble Oil
U. S. Patent 1,965,935

A soluble oil composed of the following ingredients has unique emulsification and stability properties:

Sodium Corn Oil Soap	14	g.
Water	6	g.
Mineral Oil	64	g.
Water White Rosin	10	g.
"Carbitol" (Monoethyl Ether of Diethylene Glycol)	2	g.
Diethylene Glycol	4	g.

This oil is clear and will not become cloudy when cooled to a temperature of 60° F. and will not become covered with a film after standing exposed to the air at a temperature of 80° F. over a long period of time or at a temperature of 200° F. for one day. This oil will readily emulsify with water after standing exposed to the air at 200° F. for two days. Aqueous emulsions containing this oil are very stable even at a temperature of 200° F. In general, stable aqueous emulsions are prepared by using 1% to 35% of this oil, although stable aqueous emulsions can be prepared by using proportions of the oil outside these limits.

Carbon Tetrachloride and Tetrachloroethylene Emulsions

The following formula may be used for a 50% preparation: 20 g. of commercial soft soap, 6 cc. of cresol, 50 cc. of carbon tetrachloride or tetrachloroethylene and 100 cc. of liquid paraffin.

Phenol-Formaldehyde Resin Emulsion
Australian Patent 17,583

Phenol-Formaldehyde Resin	45	g.
Paraffin Oil	5	g.
(Heat together)		
Sulphonated Sperm Oil	5	g.
Olein	5	g.
Cyclohexanol	1	g.

Partially saponify above with aqueous caustic soda then add

Glue	2½	g.
Water	45	g.

Mix in homogenizer or colloid mill.

Synthetic Resin Emulsion
U. S. Patent 1,999,715

One hundred parts, by weight, of ground resorcinol are placed in a metal container or kettle which is jacketed with an outside container, in turn equipped for steam heating and water cooling. This permits of temperature regulation during the chemical reaction as it is very essential to carefully control the temperature of the reacting substances in order to prevent their conversion to the insoluble

stage. The kettle may be equipped with suitable agitators to permit the rapid churning of the kettle contents. To the resorcinol, 112 parts, by weight, of 37.5% formaldehyde solution (formalin) are added, and the temperature is increased to a maximum of 60° C., so that the resorcinol will dissolve.

In a separate container, 8 parts, by weight, of para-nitraniline are dissolved in 20 parts, by weight, of cresol having a boiling point range of from about 215° C. to 230° C. The melted paranitraniline is added to the formaldehyde solution, and the mass is thoroughly agitated, the reaction temperature being raised to from 70° C. to about 75° C. A plasticizer of vegetable or animal oils and wax with a filler and suitable coloring material may be added as a paste to the mixture in the kettle. As an example, employ 8 parts, by weight, of clay, 0.8 part, by weight, of beeswax, and 1 part, by weight, of iron oxide, all best ground in a paint mill or ball mill to obtain thorough dispersion. The paste has been found to mix readily with the thickening liquid in the kettle.

For best results, the temperature should be maintained at no higher than 80° C. When the mass in the kettle becomes stringy, and before gelatinization can take place, the emulsification enhancing agent is added. A water solution (65 parts, by weight) containing 0.1% of borax is added, first slowly, and then rapidly to the agitated resin. The borax, or any other suitable alkaline salt, serves to so enhance the emulsifying action of the wax and/or the oils (and gums, if any are used) as to enable them to properly maintain the resin in suspension in the water. This results from the fact that the borax or other alkaline salt used reduces the surface tension of the water from its normal value at the operating temperatures, thereby more readily effecting a wetting of the resin particles and enabling the wax or other fatty material used to more easily retain the resin particles in suspension. The temperature is dropped to about 20° C. and thickening of the resin takes place. A solution of alcohol (about 65 parts, by weight) or an equal quantity of a 20% benzol or toluene solution in alcohol may be added to the emulsifier to obtain proper consistency. The varnish is immediately strained to remove any foreign particles. The mass is then cooled, with accompanying increase in viscosity of the varnish, and additional alcohol or solvent mixture may be added to obtain the desired viscosity.

Chlorinated Rubber (Tornesit) Emulsions

U. S. Patent 2,008,558

Formula No. 1

50 parts, by weight, of toluene, 50 parts of water and 20 parts of pulverulent chlorinated rubber are introduced jointly into a stirring apparatus and stirred. A uniform and stable dispersion is formed in a few minutes.

No. 2

50 parts, by weight, of toluene and 50 of water are brought together and intimately stirred, 20 parts of finely divided solid chlorinated rubber being added during the stirring operation. A uniform and stable dispersion is formed immediately.

Chlorinated Rubber Emulsion

British Patent 414,072

20 parts, by weight, of oleic acid, saponified with 20 parts of sodium silicate in 200 parts of water, is stirred at 100° C. into 5 parts of chlorinated rubber dissolved in 25 parts resin oil; 125 parts of water containing casein 8 and ammonia 0.5 parts is then added.

Aqueous Dispersions of Bitumen

German Patent 557,228

a.	Soya Bean Meal	1	g.
	Water	49	cc.
b.	Caustic Soda	0.2	cc.
c.	Bitumen Mixture, Liquefied	50	g.

Boil *a* after soaking, then saponify with *b* and emulsify *c*, stirring vigorously.

Tar Emulsion

Austrian Patent 137,894

Crude Montan Wax	3 lb.
Crude Wool Fat	2 lb.
Tar	95 lb.

Heat to 80–90° C. and while mixing vigorously run into a 1% caustic soda solution heated to 60° C.

Asphalt Emulsion

U. S. Patent 1,931,072

An aqueous solution of soap (9 parts) by weight, is dissolved in warm water (78 parts), and a low grade fuel oil or crude asphaltic-base oil (20 parts) is dispersed therein. A relatively small quantity (1–2 parts) of a metallic salt

of a fatty acid, e.g., aluminum oleate is mixed therewith, the emulsion is warmed, and asphalt (296 parts) is added slowly and with agitation, and distributed uniformly throughout the mixture.

Non-Rusting Alkaline Emulsions
Latherless Shaving Cream
U. S. Patent 1,968,722

Stearic Acid	22 lb.
Glycerin	10 lb.
Ammonia (28%)	1 lb.
Sodium Nitrite	0.1 lb.
Water	67 lb.

The stearic acid is first heated to about 85° C. The glycerin and water are then mixed together apart from the stearic acid and also heated to about 85° C. To the glycerin and water add the ammonia. This solution is then poured into the stearic acid and thoroughly stirred. When the whole mix is cooled add sodium nitrite.

Polish

Carnauba Wax	12 g.
Rosin	0.5 g.
Triethanolamine Oleate	3.5 g.
Sodium Nitrite	0.1 g.
Water sufficient to make	100 g.

Library Paste

Starch	24 g.
Gum Acacia	3 g.
Glycerin	6 g.
Borax	0.5 g.
Sodium Nitrite	0.1 g.
Oil of Cloves	0.1 g.
Water	72 g.

Soap Base Lubricating Emulsion

Cottonseed Oil	3 kg.
Mineral Oil	1–2 kg.
Caustic Soda	132 g.

Heat to 180° C. until foaming stops. Add 13 kg. mineral oil in successive portions at intervals with stirring bringing up to 190–210° C. Pour into wooden tubs and cool to 70° C. Add 9 kg. water with stirring.

High-Molecular Organic Sulphonic Acid Emulsifier
German Patent 616,321

Formula No. 1

Yellow Oil from Brown Coal Tar	100 g.
Paraldehyde	10 g.
Chlorosulphonic Acid	125 g.

Add the acid at 30–35° C., cool, stir thoroughly. After 18 hours separate the sulphonic acid from unchanged oil. Pour into 3 parts of ice-water neutralized with concentrate caustic soda. Let stand, separate from impurities, dry in vacuum.

No. 2

Same, but substitute Paraldehyde by Acetaldehyde (50%)	20 g.

No. 3

As No. 1, but use Paraffin Oil from Brown Coal Tar	100 g.

No. 4

Solar Oil from Brown Coal Tar	100 g.
Heptaldehyde (Oenanthol)	20 g.
Chlorosulphonic Acid	150 g.

At 35° C. has to stand 1 day, other fact as in No. 1.

No. 5

Paraffin Oil (7.5° E at 20°)	100 g.
Benzaldehyde	15 g.
Chlorosulphonic Acid	130 g.

Method as No. 1.

Sulphonation of Cetyl Alcohol

Melt the	
Cetyl Alcohol	40 g.
Dissolve in	
Acetic Anhydride	20 g.
Treat with	
Sulphuric Acid (Concentrated or Fuming)	40 g.

The reaction is run below 10° C.

Sulphonating Napthenic Alcohols
U. S. Patent 2,000,994

One part by weight of a raw commercial naphthenic acid (boiling point 90–230° C. at 13 mm. pressure) is dissolved in 2 parts by weight of 3% butyl alcoholic hydrochloric acid and heated to boiling for four hours. The butanol and hydrochloric acid are then distilled off and 200 kg. of the naphthenic acid so treated are reduced in an autoclave with 90 kg. of sodium and 1,000 kg. of butyl alcohol. The whole is then heated under constant agitation to 140° C. for 1½ hours. After cooling to 90° C. the reaction mass is poured into water, the underlying liquor is drawn off and the remainder is neutralized and washed several times. It is then dried over lime and the excess butyl alcohol is removed by distillation. The product so obtained boils between 70 and 230° C. at 10 mm. pressure and posseses an acetyl saponifi-

cation number 175 and an iodine number 22. It is free from saponifiable components and dissolves to give a clear solution in concentrated sulphuric acid. Dilution with water produces no turbidity. The conversion of the product into the sulphuric acid derivative can be carried out in the following manner:

20 parts by weight of chlorosulphonic acid are gradually added to 50 parts of the above mentioned product and to this are subsequently added 5 parts of sulphuric acid whereupon the temperature rises to 40° C. The reaction mass is then washed with salt solution and neutralized. Upon evaporation in vacuo the sulphonate and/or sulphate is obtained in a solid grindable form.

Sulphonating Oils

A. Cod, Sperm, Cottonseed and Castor Oils

1. High Sulphonation Product

Any of the Above Oils	735 lb.
Sulphuric Acid	275 lb.

Run in the acid in a thin jet as quickly as possible with good mixing but do not allow temperature to rise above 95° F. Agitate for 5 or 6 hours until a sample in the case of cod oil is soluble in distilled water without opalescence. With cottonseed oil the solution will be slightly translucent. The oil is now dropped into the mixing tank, containing two and one-half times the volume of oil of Glauber's salt solution, 10° Bé. Agitate smoothly for five to ten minutes and warm to 104° F. Allow to separate. Draw off the water and make the oil nearly neutral to methyl orange with caustic soda. Allow to stand over night. It is to be noted, that according to the acidity of the oil at this stage, when allowed to stand, the amount of free fatty acid in the finished oil can be regulated. Next morning, draw off the water again, and clear with caustic soda.

B. Red, Cod, Castor, Neatsfoot or Refined Corn Oils

2. Quick Sulphonation Method

Any of the Above Oils	775 lb.
Sulphuric Acid	225 lb.

Usually used for oleic acid, cod oil, castor oil, Neatsfoot oil, refined corn oil, and mixed oils. Sulphuric acid = 22½% on the weight of the oil.

The acid is run into the oil quickly while the oil is violently agitated. With a ten-barrel batch of oil, the acid takes about thirty minutes to run in. The temperature rises quickly and as soon as it reaches 130–135° F., the oil mixture is dumped quickly into a mixing tank situated underneath the sulphonating tank. The mixing tank contains Glauber's salt solution 10° Bé. equal to double the volume of the oil. The Glauber's salt solution is at room temperature. The oil and Glauber's salt solution is agitated smoothly for five to ten minutes and the oil allowed to separate. Separation is nearly complete in half to one hour. The clear water is drawn off to a storage tank, and after neutralizing with caustic soda, is used over again for the next batch. The oil is neutralized with caustic soda until it is nearly neutral to methyl orange, that is, slightly on the acid side. Allow the oil to stand until morning and a further separation will take place. When the oil is completely separated, and the water drawn off, the oil should test 20% water. It is now cleared by the addition of further caustic soda. In winter time, it is better to use caustic potash for the final finishing, as it gives a more liquid oil. In testing the acidity of the oil, after the first separation, it is recommended to use an ether and salt solution for the titration with methyl orange.

C. Castor Oil, Concentrated

Castor Oil	1000 lb.
Sulphuric Acid (100%)	1000 lb.

Dilute the castor oil with ethylene dichloride. Run the acid in slowly to the previously cooled oil and solvent mixture. Do not allow the temperature to rise above 60° F. After the acid is all in, continue stirring until a few drops dissolve perfectly clear in distilled water, and also dissolve perfectly clear in a saturated solution of calcium sulphate. Do not continue stirring after this point, but then add to it a 5% solution of Glauber's salt solution, equal in volume to three times that of the sulphonated mixture. The solution of Glauber's salt is kept cool by means of ice. The temperature not being allowed to rise above 60° F. Allow to separate, and wash twice with 25% Glauber's salt solution. Separate, and add caustic soda until neutral, and then distil off the solvent.

D. Oleic Acid and Ricinoleic Acids, Concentrated

Above Fatty Acids	100 lb.
Sulphuric Acid (100%)	100 lb.

On a large scale some manufacturers use a dough type mixer, brine cooled, while others use a system, wherein the sulphuric acid and oil are sprayed simultaneously by a whirl disc system into a

large reaction vessel, being sufficiently cooled previously so that the heat of reaction does not cause the product formed to become unduly heated before running out of reaction vessel. Sulphonation uses 100 lb. fatty acids and 100 lb. sulphuric acid 100 per cent strength.

Keep temperature below 50° F. while adding the sulphuric acid. Sulphonation time is 50–60 minutes. Wash with Glauber's salt solution 12–15° Bé. twice, keeping temperature below 70° F. Let stand over night to separate and neutralize with caustic soda. The product is allowed to stand 3–5 days at 15–20° C. to allow the Glauber's salt to crystallize out. This crystallization can be improved by the addition to the oil of a small quantity of a volatile solvent such as xylene, trichloroethylene, carbon tetrachloride, etc.

Sulphonation of Castor Oil
French Patent 745,787

a.	Castor Oil	100 kg.
b.	Sulphuric Acid (66° Bé.)	100 kg.

Add *b* to *a* in very thin jet (2 hours) and with continuous stirring, keeping the temperature at 10–13° C. Wash product once or twice with salt-solution, keeping the temperature below 15° C. Separate oil from the aqueous layer in the usual way, neutralize.

Sulphonating Oils
U. S. Patent 1,967,655

Formula No. 1

100 kg. of ricinoleic acid are sulphonated at temperatures below 5° C. with 90 kg. of 30% oleum. 30 kg. of glycol mono-methyl ether are added to the crude sulphonation product. After completion of the reaction, ice is added and the product washed with Glauber's salt solution.

No. 2

100 kg. of 12-hydroxy stearic acid are mixed with 65 kg. of glycol mono-ethyl ether and sulphonation effected at temperatures below 0° C. with 36 kg. of chlorosulphonic acid. The product is worked up as in No. 1.

No. 3

100 kg. of naphthoic acid are sulphonated with 70 kg. of chlorosulphonic acid, 55 kg. of glycol mono-methyl ether are added to the crude sulphonation product. In place of sulphuric acid and the like sulphonating agents, alkyl sulphuric acids or alkyl chlorosulphonic acids may be employed.

Sulphonation of Fatty Oils, Fats, Waxes
Austrian Patent 134,993

Whale Oil (Sperm Oil)	1 lb.
Spindle Oil	3–4 lb.
Fuming Sulphuric Acid (30% SO_3)	1 lb.

Run reaction at 40–45° C., adding sulphuric acid in a jet. Stir, then let stand 12 to 24 hours; wash with sodium chloride- or sodium sulphate-solution, separate from acid wash water. Neutralize, if necessary, with organic bases, until a drop of oil, when diluted with water, shows nearly no turbidity.

Cellulose Ester Emulsions
U. S. Patent 1,970,572

A pyroxylin base is prepared by colloiding 12.5 parts by weight of alcohol-wetted pyroxylin (10 parts of dry ½" pyroxylin) with 20 parts by weight of blown linseed oil in a suitable mixer, such as the Werner and Pfleiderer mixer. 25 parts by weight of a solvent mixture are then added to the colloided mass in portions equalling 5 parts by weight to form a homogeneous base having the following composition:

Pyroxylin (½ sec.)	10 g.
Alcohol (Denatured)	2.5 g.
Blown Linseed Oil	20 g.
Butyl Acetate	20 g.
Butyl Lactate	5 g.

An emulsion is prepared by heating 0.5 part by weight of sodium oleate with 15 parts by weight of gasoline to a clear gel; after which 2 parts by weight of water are added to the hot gel with vigorous stirring, thus forming a concentrated emulsion of gasoline in water that is stabilized by sodium oleate. For convenience this will hereafter be called the agent emulsion.

The presolution or solvating of the sodium oleate in gasoline or some similar liquid is desirable to assure uniform distribution.

17.5 parts by weight of the agent emulsion are then stirred vigorously into 57.5 parts by weight of the pyroxylin base with a high speed stirrer of the propeller blade type.

Inversion of the emulsion from the water-in-oil type to the oil-in-water type may be effected in various ways, as explained below, but in this example it is effected by the sudden addition of water in relatively large quantities, the time of

addition being the controlling factor in particle size, as indicated by systems *a*, *b*, and *c*.

System (*a*): 20 parts by weight of water are added in small portions with vigorous stirring, thus yielding a viscous water-in-oil type dispersion. 10 parts by weight of water are then added with vigorous stirring to invert the system to the oil-in-water type. 68 parts by weight of water are added next, either slowly or rapidly, with more moderate stirring. Microscopic measurements of particle size average 1.19 microns, and the dispersion spontaneously wets an absorbent type of paper.

System (*b*): 35 parts by weight of water are added in small portions with vigorous stirring, yielding a viscous water-in-oil type dispersion. 10 parts by weight of water are then added with vigorous stirring to invert the system to the oil-in-water type. 53 parts by weight of water are next added, either slowly or rapidly, with more moderate stirring. The average particle size is 1.92 microns, and the dispersion does not wet paper spontaneously. Vacuum filtration is required in order to effect paper penetration, and some separation of disperse phase occurs on the surface of the paper.

System (*c*): 90 parts by weight of water are added in small portions with vigorous stirring, yielding a viscous water-in-oil type dispersion. 8 parts by weight of water are then added with vigorous stirring to invert the system to the oil-in-water type. The average particle size is 2.23 microns. Severe separation of the disperse phase occurs on the surface of the paper during vacuum filtration, and the dispersion is not adapted to paper impregnation.

Petroleum Demulsifier

Diglycol Laurate	83	g.
Sodium Silicate	5	g.
Rosin Soap	5	g.
Phenol	4	g.
Water	1½	g.
Paraffin	1½	g.

Margarine Emulsifier

Refined and deodorized sunflower oil oxidized with a current of dry air at 250° C. for 10 hours shows better emulsifying properties than Paalsgaard oil. When 0.4% of this oil is added to the emulsified mixture in the manufacture of margarine, the product after standing 54 hours retains the good taste and odor and high moisture content (14.6%).

Breaking Petroleum Emulsions
U. S. Patent 1,976,602

React 250 lb. of phthalic anhydride with 500 lb. of castor oil at a temperature of approximately 120 to 145° C. for approximately 6 to 12 hours. The reaction can be followed roughly by withdrawing a small sample of the partially reacted mass and permitting it to cool on a watch glass. When the reaction is completed, crystals of phthalic anhydride no longer appear. When the sample no longer shows the presence of such crystals on cooling, it can be titrated with a standard volumetric alkaline solution, so as to indicate that the acid which remains is due entirely to the carboxylic hydrogen and not due to any unreacted phthalic anhydride. One must guard against a rise in temperature.

The product of reaction represents a viscous yellow oil not unlike blown castor oil in consistency. It is neutralized with sufficient ammonium hydroxide to completely convert all acidic material into the ammonium salt. The product thus obtained is substantially water-soluble and is suitable for use.

A treating agent or demulsifying agent of the kind described may be brought in contact with the emulsion to be treated in any of the numerous ways now employed in the treatment of petroleum emulsions of the water-in-oil type with chemical demulsifying agents, such for example, as by introducing the treating agent into the well in which the emulsion is produced, introducing the treating agent into a conduit through which the emulsion is stored, or introducing the treating agent into a container that holds a sludge obtained from the bottom of an oil storage tank. In some instances, it may be advisable to introduce the treating agent into a producing well in such a way that it will become mixed with water and oil that are emerging from the surrounding strata, before said water and oil enter the barrel of the well pump or the tubing up through which said water and oil flow to the surface of the ground. After treatment the emulsion is allowed to stand in a quiescent state, usually in a settling tank, at a temperature varying from atmospheric temperature to about 200° F., so as to permit the water or brine to separate from the oil, it being preferable to keep the temperature low enough so as to prevent the valuable constituents of the oil from volatilizing. If desired, the treated emulsion may be acted upon by one or the other of various kinds of apparatus

now used in the operation of breaking petroleum emulsions, such as homogenizers, hay tanks, gun barrels, filters, centrifuges or electrical dehydrators.

The amount of treating agent on the anhydrous basis that is required to break the emulsion may vary from approximately 1 part of treating agent to 500 parts of emulsion, up to a ratio of 1 part of treating agent to 20,000 parts of emulsion, depending upon the type or kind of emulsion being treated. In treating exceptionally refractory emulsions of the kind commonly referred to as "tank bottoms" or "residual pit oils," the minimum ratio above referred to is often necessary, but in treating fresh emulsions, i.e., emulsions that will yield readily to the action of chemical demulsifying agents, the maximum ratio above mentioned will frequently produce highly satisfactory results. For the average petroleum emulsion of the water-in-oil type a ratio of 1 part of treating agent to 10,000 parts of emulsion will usually be found to produce commercially satisfactory results.

Tree Bands for Caterpillar and Flies

Formula No. 1

a.	Rosin Oil	9 g.
	Spindle Oil	20 g.
b.	Slaked Lime	6–9 g.
	Spindle Oil	65–62 g.

Add *a* to *b*, stir violently to homogenize. Stir until congealing starts. Allow to set for 24 hours.

No. 2

Rosin	30 g.
Linseed Oil* Varnish	20 g.
Beeswax, Yellow	2 g.

* Or Rape Seed Oil, or Wool Fat, when a longer catching period is desired.

The melted and well mixed glue is put on the bark of the tree; over it put a ring of cloth, fastened with wire, then put over that again a layer of glue, all around the stock.

No. 3

Colophony	300 g.
Linseed Oil Varnish	200 g.
Yellow Wax	20 g.

Protecting Mixture for Young Trees Against Game

Ceresin (58–60° C.)	20 oz.
Spindle Oil, Distilled	60 oz.
Dippel's Animal Oil or Carbolineum	20 oz.

Melt up and stir until cold.

Codling Moth Tree Bands

Formula No. 1

Cloth is impregnated with

Beta Naphthol Crude	1 lb.
Red Engine Oil	1.5 pt.

Apply at 130–132° F.

No. 2

Beta Naphthol Crude	1 lb.
Mineral Oil (200–300 sec.)	1½ pt.
Gasoline	1 pt.

No. 3

Water	2 gal.
Ammonia (28%)	2.4 fl. oz.
Casein	4 oz.
Mineral Oil, Refined (65–75 sec.)	8 gal.

Grafting Wax

Formula No. 1

a.	Colophony	350 g.
	Beeswax	10 g.
	Pitch	60 g.
	Linseed Oil	25 g.
	Turpentine, Venice	15 g.
b.	Methanol	85 g.

Melt up *a*, then stir until cool, add *b*.

No. 2

a.	Linseed Oil	1 lb.
	Turpentine Oil	4 lb.
	Beeswax	3 lb.
	Colophony	9 lb.
b.	Methanol	1 lb.

Dissolve *a* cautiously, thin with *b*.

No. 3

Castor Oil	¼ lb.
Rosin	5 lb.
Beeswax	1 lb.
Charcoal	¾ lb.
Glyceryl Monostearate	1 lb.

Melt and apply with brush. This excludes air and fungi; prevents drying out and doesn't injure live tissues.

Bleaching Citrus Fruit Blemish

Navel oranges, badly blemished with sooty blotch, are thoroughly cleaned by dipping for ½–1 min. in a solution containing 0.25 lb. each of boric acid and chloride of lime.

Removing Arsenic Residues from Fruits

Wash with a 1% solution of ammonia or caustic soda.

Preserving Color of Leaves

Immerse leaves in

Glycerin	5 g.
Copper Sulphate	2 g.
Water	93 cc.

Non-Poisonous Fly-Papers

Quassia	16 oz.
Colocynth	2 oz.
Long Pepper	4 oz.
Water	to make 1 gal.

Boil until the decoction is reduced to 4 pints; strain; dissolve in the clear

liquid 4 oz. of sugar. Dip the absorbent paper in this solution.

Cobalt Fly-Papers

Dissolve cobalt chloride, 1 oz., and Tartar Emetic, 1 d., in 1 gal. of the Quassia decoction (formula above), and dip the paper in the resulting solution.

Fly Catcher

Colophony (Rosin) G	49 g.
Mineral Oil (Viscosity 3½–4° E at 50° C.)	36 g.
Lanolin, Anhydrous	4 g.
Beeswax, Pure	1 g.
Castor Oil	2 g.

Moth Powder

Camphor	4 oz.
Benzoin	1 oz.
Black Pepper	2 oz.
Cedar Sawdust	5 oz.

Mix after reducing the solids to a coarse powder.

Roach Eradicating Powder

Sodium Fluoride	60 oz.
Wheat Flour	20 oz.
Corn Starch	12 oz.
Cocoa	8 oz.

The sodium fluoride should be in a finely powdered form and thoroughly mixed and then sifted to make certain of a homogeneous product. This may be made into a paste with a minimum of water and placed in new or used crown caps, allowed to dry and laid in roach infested places. It may also be dusted as a powder. The filled caps, however, can be used over again and are cleaned up more readily than the powder.

Mosquito Spray for Outdoor Gatherings

Kerosene Containing Pyrethrum Extract Equivalent to 1 lb. of Flowers (Analyzing 0.9% Pyrethrins) per Gallon	100 gal.
Water	50 gal.
Sodium Laurel Sulphate (Emulsifier)	6 lb.

The emulsifier is first mixed with the water and transferred to the tank. The oil is then run in gradually into the tank with agitators and pump working at full speed. After all the oil has been added the pumping is continued until the entire mixture has passed through the hose and back into the tank two or three times or until the mixture is thick and homogeneous, showing no free oil on the surface. The finished product is then pumped into drums for storing. This constitutes the stock emulsion. Excessive foaming may be eliminated by dissolving about two or three pounds of wool grease (degras) in the kerosene before emulsifying. Any other suitable apparatus for emulsification can be used.

The cost of preparing the concentrated emulsion is about 23 cents per gallon, based on the present price of pyrethrum, which makes out slightly over 2 cents per spray gallon. When purchased, the stock emulsion costs from 30 to 50 cents per gallon, depending on the quantity ordered.

Directions for Spraying

About half an hour before the gathering takes place the area is completely sprayed with the larvacide diluted 1 : 10 or 1 : 12, that is 1 part of larvacide is mixed with 10 or 12 parts of water. The spraying is done with a power sprayer capable of developing a pressure of 100 pounds or more per square inch and equipped with a spray gun. Before mixing with water the concentrated stock larvacide should be well shaken. Also the diluted spray should be frequently stirred or agitated in order to secure uniform distribution throughout the spraying operation. The spray is applied in the form of a fine fog directly to the grass, grounds, tents, trees, shrubs, etc. Then the stream is directed upward so as to saturate the atmosphere with the fog. At no time should a coarse spray be applied, since it is unnecessary and may injure vegetation. The grounds for about 20 feet outside the area should also be thoroughly fogged, especially when tall grass, shrubs, woodland and other vegetation are present offering a hiding place from which adult female mosquitoes may issue suddenly at dusk in large numbers. If the area has been thoroughly fogged one treatment may suffice for two hours or even the rest of the evening. If mosquitoes become bothersome later in the evening, the area on the outside of the "gathering" grounds should again be fogged, directing the stream primarily upward and towards the ground to be protected. This outside fogging may be repeated again if necessary. On small areas, such as back-yards, private lawns, etc., a knapsack sprayer or bucket pump capable of producing a fog spray, of 10 to 15 feet high, can be used.

Weed Killers

Formula No. 1

Poisonous:

Arsenite of Soda (Concentrated Solution)	1 gal.
Water	20 gal.

Mix through and sprinkle on vegetation to be exterminated, making application on a bright clear day.

No. 2

Non-Poisonous:

Chlorate of Soda	1 lb.
Water	1 gal.

Dissolve chlorate of soda in the water and use this solution without further dilution by sprinkling on vegetation wished exterminated.

Weed Killer

British Patent 418,061

Formula No. 1

Ammonium Chloride	83 g.
Copper Sulphate	5 g.
Calcium Carbonate	12 g.

No. 2

Ammonium Chloride	25 g.
Sodium Nitrate	25 g.
Ferrous Sulphate	50 g.

Ragwort Weed Killer

Use ammonium sulphocyanide (5–10% solution), 200 gal. per acre. Dry weather is best time.

Killing Weeds on Lawns

To kill weeds on lawns, golf courses, etc., treatment with a solution of ammonium sulphate and soft soap has been found effective. A mixture adopted for this purpose in England contains 1 lb. of ammonium sulphate, ½ lb. of soft soap, and 1 gal. of water, to be used for every 8 square yards.

Hydrogen Sulphide as an Insecticide and Fungicide

Extensive trials carried out by the Azov-Black Sea branch of the All-Union Institute of Plant Protection have proved that hydrogen sulphide may be successfully used for rodents, insects, and fungi control. Laboratory experiments have shown that a 0.02 to 0.03% concentration of hydrogen sulphide in air is sufficient to kill the earless marmot. Field experiments proved that 4 to 6 g. of hydrogen sulphide per burrow are quite sufficient, while in better conditions (i.e., when the soil is warm and dry) this rate may be reduced to 3 g. per burrow. The same results are obtained when applying sulphuric slags, which emit hydrogen sulphide because of the action of moisture absorbed from the air. In this case some 8 to 9 g. of slag per burrow are sufficient, the mortality of earless marmot reaching 92 to 98%.

Hydrogen sulphide proved especially efficient as a means of destroying barn mites, being more penetrable in grain than chloropicrin and carbon disulphide.

Experiments made in the huge Millerovo elevator have proved the practicability of this method. Exposure for 40 hours at a rate of 400 g. of hydrogen sulphide per ton of grain proved efficient. Hydrogen sulphide does not reduce the germination rate of seeds and only a few strains decrease their germination with 4 to 8%, while the majority of strains even increase their germination rate with 15 to 30 per cent. Experiments on feeding the treated grain to cocks and rabbits have shown that no injury has resulted.

Fair results have been obtained, too, when applying hydrogen sulphide as a fungicide. Laboratory experiments have proved that the spores of main fungous diseases of seeds perish when seeds are exposed to hydrogen sulphide for 1 to 4 days at a rate of 200 to 400 g. of gas per cu. m. (smut and bacteriosis of cereals, goummosis of cotton, bacterial rot of vegetables).

Red Squill Extract

Extract 15 g. red squill by repeated extractions with 100 cc. boiling methanol in an enclosed system percolator.

Insect Spray

Formula No. 1

Petroleum Spirits	1000 cc.
Pyrethrum Extract	5 g.
Sassafras Oil	5 cc.
Methyl Salicylate	20 cc.

No. 2

Petroleum Spirits	550 cc.
Vaseline Oil	450 cc.
Methyl Salicylate	20 cc.
Sassafras Oil	10 cc.
Pyrethrum Extract	10 g.

Insecticide Spray Spreader

Water	5 cc.
Caustic Potash	7.4 g.
Pine Tar Oil	44.3 cc.
"Cellosolve"	10 cc.
Oleic Acid	33.3 cc.

Mix in the order given.

Light Stable Insecticide Spray
U. S. Patent 2,011,428

Gum Ghatti	2.4	lb.
Cresylic Acid	0.18	lb.
Water	35	lb.
White Oil (80 sec. Saybolt at 100° F.)	62.4	lb.
1,4 Toluido Anthraquinone	0.02	lb.

The concentrated emulsion may be prepared by intimately mixing the ingredients in a colloid mill or by passing the mixture through a centrifugal pump or in any other suitable manner to give a concentrated emulsifiable composition which may readily be diluted to yield an emulsion suitable for spraying purposes.

Codling Moth Control by Nonarsenical Sprays

Sprays containing nicotine sulphate (1:640) and white oil (1:80) gives much better control of the codling moth than lead arsenate sprays.

Non-Poisoning Fruit Spray
Formula No. 1

Diglycol Laurate	5	qt.
Pyrethrum Extract (20 Fold)	¾	pt.
Water	100	gal.

No. 2

Derris Extract (5%)	1	qt.
Skim Milk Powder	1	lb.
Water	100	gal.

No. 3

Derris Root, Ground	10	lb.
Filler or Diluent	90	gal.

Orange Worm Spray
Formula No. 1

Potassium Aluminum Fluoride	50	lb.
Fiber Talc	45	lb.
Mineral Oil, Refined (70 Viscosity)	5	lb.

Use 1 lb. per tree.

No. 2

Sodium Aluminum Fluoride	3	lb.
Water	100	gal.
Liquid Blood Albumin Spreader	½	pt.

Peach Tree Spray

A combination of the lead arsenate and zinc-lime sprays is effective not only against chewing insects such as curculio and codling moth, but against bacteriosis. The formula is:

Zinc Sulphate	8	lb.
Hydrated Lime	8	lb.
Water	100	gal.

Add:

Lead Arsenate	3	lb.

The spray should be used as soon as prepared.

Prune Worm Spray

Pyrethrum Extract	1	qt.
Kerosene	6	gal.
Neutral Soap	4	lb.
Water	94	gal.

Pear Tree Blight Injection
U. S. Patent 2,017,269

Pine Tar Oil	1	oz.
Turpentine	16	oz.

Gladiolus Thrip Spray

Manganese Arsenate (26% Arsenic)	4	lb.
Brown Sugar	66	lb.
Water	100	gal.

Adhesive for Hydrated Lime in Sprays

A spray of 20 lb. calcium hydroxide and 3 lb. aluminum sulphate in 100 gal. of water will give an adherent white spray residue which is repellent to the Japanese beetle. The mixture may be of value as an adherent for other spray ingredients.

Lead Arsenate Substitute

This compound is prepared by fusing 1 part diphenylamine with 2 parts sulphur at 180° C., iodine being used as catalyst. Upon recrystallizing from toluene, the light yellow crystal compound melting at 180° C., neutral, insoluble in water, slightly soluble in cold mineral oils and the usual organic solvents, is obtained. In laboratory tests, the compound is as effective as lead arsenate for codling moth larvae.

San Jose Scale Spray

Creosote Oil Emulsion	1	lb.
Mineral Oil Emulsion	3	lb.

Scale Insect Poison

Paraffin Oil	1½	gal.
Ferrous Sulphate	6	lb.
Caustic Soda	20	lb.
Quicklime	3	lb.
Water	to make 100	gal.

Holly Sprays

Use a 3% oil emulsion containing a little nicotine sulphate. This prevents scale on living trees.

Cut holly is freed from insects by dipping and soaking for 10 minutes at 24° C. in

Formalin	1/5 gal.
Nicotine Sulphate (4%)	1/5 gal.
Linseed Oil Soap	1 lb.
Water	100 gal.

Derris Spray

U. S. Patent 1,934,057

Derris Extract	1–25 oz.
White Mineral Oil	40–80 oz.
Soap	5–25 oz.
Water	up to 35 oz.

The above is used diluted with water to give a mixture containing 0.06–0.25% Derris extract.

Fungi Spray

U. S. Patent 2,000,843

Soft Soap	33 lb.
Cresol Soap (2% Solution)	11 lb.
Tobacco Extract (10%)	17 lb.
Potassium Permanganate (1/2 Normal)	22 lb.
Vegetable Glue	17 lb.
Alcohol	1/4–2 lb.

Lime, Sulphur and Salt Wash

Formula	No. 1	No. 2	No. 3	No. 4	
Lime	2	1½	1¾	2	lb.
Sulphur	1½	1½	1¾	1¾	lb.
Salt	1	1½	1¾	1	lb.
Water	4	4	4	4	gal.

Boil the lime and sulphur together in a little of the water, and when combined add the rest of the water and salt. Effective as a winter application for scale.

Lime Sulphur Spray

Directions for making 50 gal. of lime sulphur spray are as follows:

Sulphur	8 lb.
Spent Carbide Residue	3 gal.
Calcium Arsenate	8 oz.

Heat about 1/3 of the total amount of water, adding the sulphur slowly to make a thick paste. When the water is hot, add all the carbide residue, thoroughly stirred. Mix and add another third of water and continue to cook and stir for about 45 to 60 minutes until a clear, orange-colored solution is obtained. Then add the rest of the water and the calcium arsenate. Let the mixture settle and run it through a fine sieve as it is poured into the spray tank. This should be diluted in a ratio of about six parts water to one part of the solution.

Soil Sterilization in Field and Garden

Formula No. 1

The stand of such vegetables as peas, spinach and beets can usually be greatly improved by watering, immediately after planting, with a dilute solution of formaldehyde.

Formaldehyde (40%)	1 oz.
Water	124 oz.

Use this solution at the rate of 1 gal. for 200 feet of row.

No. 2

Formaldehyde (40%)	15 oz.
Infusorial Earth	85 oz.

When infusorial earth is used as a carrier the full strength of the formaldehyde is maintained for a longer time than when other materials, such as charcoal or muck, are employed. Mix thoroughly, taking care to break up lumps. Use 6 oz. of this dust for each bushel of soil, or 1½ oz. per square foot of flat area. Insure that the dust is well mixed with the soil. After placing in flats, sow seed and water immediately.

Adhesives for Sulphur Dusts

Sulphur is more than twice as adhesive if applied to wet citrus foliage as if applied to dry foliage; 0.25 inch of rain removed so much sulphur dust applied to dry foliage that its effectiveness was lost. Addition of 2% of glue or gum tragacanth to dusting sulphur increased its adhesiveness 4–5 times over sulphur applied to dry foliage and twice over sulphur applied to wet foliage. When 5% of blood albumin was added to sulphur dust, its adhesiveness was increased 10 times and 5 times over that of sulphur applied alone to dry leaves and wet leaves respectively. Sulphur dust containing blood albumin remained on the leaves almost as well as did lime.

Pepper Disease Control

The use of an organic mercury dust or solution of 1 to 1000 mercuric chloride with an exposure of 5–8 minutes effectively sterilizes pepper seeds before planting. For treatment of the growing plant to control fungus diseases the use of either Bordeaux mixture or copper-lime dust is recommended. For the Bordeaux mixture, a concentration of 2–4–50 should be applied to seedbeds and 4–6–50 to more mature plants. The copper-lime dust should be mixed in the proportion of 20 lb. of dehydrated copper sulphate and 80 lb. of calcium hydroxide. These components should be mixed dry.

Dust for Control of Cucurbit Wilt

Basic Copper Chloride	½ oz.
Flour	5 oz.
Calcium Arsenate	1 oz.

Keep plants well covered with a light coating of dust from the time they appear through the ground until bearing stage is reached. New growth should be kept dusted. Number of applications will depend upon rate of growth and weather conditions.

Seed Disinfectant (Dustless)
French Patent 770,560

Mercuric Chloride	5 oz.
Lanolin	5 oz.
Talc	90 oz.

Lettuce Seed Sterilization

Soak 4 to 8 hours in following:

Calcium Hypochlorite	11.5 oz.
Water	1 gal.

Stir thoroughly; allow to settle; decant and use at once. Wash seeds after above treatment.

Spreader for Nicotine Sprays

Spreaders which contain twice the amount of active ingredients and which are 4 times as effective as potassium soaps in the control of Aphis Rumicis on nasturtium leaves, are made as follows:

Formula No. 1

Water 5 g., potassium hydroxide (92%) 7.40 g., pine-tar oil (specific gravity 1.035) 44.30 g., ethylene glycol monoethyl ether 10.00 g., oleic acid 33.30 g.

No. 2

Water 5 g., potassium hydroxide 7.40 g., pine-tar oil 48.80 g., isoamyl alcohol 3.00 g., phenol (85%) 1.00 g., ethylene glycol monoethyl ether 1.50 g., and oleic acid 33.30 g.

Cotton Root Rot Remedy

Apply 3% ammonium hydroxide solution.

Preventing Brown-Rot on Lemon Trees

Apply

Zinc Sulphate	40–25 lb.
Hydrated Lime	20–25 lb.
Sand	40–50 lb.

around base of trunk, piling 8 inches high and hold in place by paper collar.

Lemon Scale Control

Yellow Sulphur	75 lb.
Gas Purification Sulphur	25 lb.
Talc	10 lb.

Grind to 200–300 mesh; use 0.4 to 1 lb. per tree at 17-day intervals. Five to seven applications are used.

Control of Cabbage Root Fly

Corrosive sublimate, applied at a strength of 1 oz. in 8 gal. of water, is the most successful means, at present known, of reducing the damage done to plants of the cabbage tribe (Brassicæ) by the cabbage root fly. The treatment consists of applying to each plant about one-quarter of a pint of the solution in such a manner as to flood the soil evenly round the base of the plants on three occasions at 10-day intervals, starting four days after setting out the plants. Of the other methods tested, commercial naphthalene powder, about ¼ oz., applied to the soil round the plants on three occasions at 10-day intervals commencing on the day of transplanting, possesses certain advantages, especially as regards cheapness, simplicity of application and the non-poisonous nature of the substance.

Control of Weevils in Stored Beans and Cowpeas

Protection is obtained by adding 1 lb. of slaked lime per bu. of beans or cowpeas and mixing thoroughly. Sodium fluosilicate, used at the rate of 1 part to 1500 parts of grain, gives full protection against the grain beetle, *Sitophilus granaria.*

Non-Poisonous Insect Exterminator

Petrolatum, Liquid	1000 g.
Pyrethrum Powder	200 g.
Pine Needle Oil	13 g.
Juniper Oil	2 g.
Lavender Oil	1 g.
Orange Oil	1 g.

To Kill Ants in Lawns and Gardens

Make a hole about 18 inches deep in the center of the ant hill with an old broom handle and then pour in a solution of poison made by dissolving 1 oz. of sodium or potassium cyanide * in 1 gal. of water. Cover with dirt. If the soil is alkaline use one-half the quantity of water and make another solution of 1 oz. of alum to 2 qt. of water and pour one-half of each in the hole.

* Deadly poison. Do not allow contact with broken skin or cuts.

Beetle Powders

Formula No. 1

Barium Carbonate	10 oz.
Borax	20 oz.
Sugar	5 oz.

No. 2

Sodium Fluoride	10 oz.
Kaolin	10 oz.

No. 3

Kieselguhr	22 oz.
Sodium Fluoride	40 oz.
Sodium Chloride	10 oz.

No. 4

Powdered Borax	4 oz.
Flour	2 oz.
Chocolate Powder	1 oz.

No. 5

Powdered Borax	10 oz.
Insect Powder	1 oz.
Starch	1 oz.

Poultry Lice Powders

Formula No. 1

Naphthalene	10 g.
Sulphur	20 g.
Tobacco	40 g.
Talc	130 g.

No. 2

Naphthalene	20 g.
Sulphur	20 g.
Tobacco	40 g.
Talc	120 g.

No. 3

Naphthalene	40 g.
Sulphur	20 g.
Tobacco	40 g.
Talc	100 g.

No. 4

Naphthalene	20 g.
Sulphur	20 g.
Tobacco	40 g.
Cresol	1 g.
Talc	119 g.

No. 5

Naphthalene	20 g.
Sulphur	20 g.
Sodium Fluoride	50 g.
Talc	110 g.

Dog and Poultry Flea and Lice Killer

Formula No. 1

Derris Powder	¼–1 kg.
Water	10 l.

Shake well and rub into skin.

No. 2

Derris Powder	½–1 kg.
Talc	10 kg.

No. 3

Rotenone Solution	0.2%

Endive Fly Treatment

Soak roots, before planting, for 15 to 20 minutes in:

Nicotine (50% Solution)	20 cc.
Sal Soda	5 g.
Water	1 l.

Fly Dishes

a. Quassia Wood	500 g.
Black Pepper	50 g.
Water	2 l.

Extract cold 4 days, then evaporate to 1 liter, filter and add:

b. Sugar	100 g.

Color with red or green aniline dye.

Impregnate cardboard dishes with solution; dry in air.

Killing Fly Larvae in Cesspools

Add 0.15% by weight of sodium cyanide to the fecal matter.

Derris Insecticide for Caraway Moth

Derris Root Powder (8% Rotenone)	1 kg.
Talc	3 kg.

Apply at rate of 75 kg. per hectare in two applications.

Grasshopper Poison

Formula No. 1

Bran	100 lb.
Beet Molasses	2 gal.
Amyl Acetate	3 oz.
Sodium Arsenite, Liquid	1 qt.
Water	10–12 gal.

No. 2

Bran	100 lb.
Sodium Arsenite, Liquid	1 qt.
Sodium Arsenite, Powder	2 lb.
Water	10–12 gal.

Groundnut (Peanut) Oil Insecticide

This emulsion is made by mixing 500 cc. of groundnut oil with 75 cc. of oleic acid and then pouring the mixture slowly, with constant agitation, into a solution of 50 cc. of ammonia in 200 cc. of water. For use, this emulsion should be diluted with nine times its volume of water. It is stated that all insects, the wax-covered bodies of which are resistant to ordinary aqueous liquids, are poisoned by this 2% oil emulsion.

Rat Fumigant

Potassium Nitrate	30 oz.
Sulphur	42 oz.

Sawdust	18 oz.
Sand	6 oz.

Mix together and burn.

Rat Bait

Formula No. 1

Ground Dried Bread	65 lb.
Ground Fresh Pork Fat	5 lb.
Ground Fresh Halibut or Haddock or Cod	20 lb.
Powdered Red Squill	10 lb.

No. 2

Ground Dried Bread	85 lb.
Glycerin	5 lb.
Powdered Red Squill	10 lb.

No. 3

Ground Dried Bread	37 lb.
Glycerin	3 lb.
Powdered Red Squill	10 lb.
*Fresh Bait	50 lb.

No. 4

Ground Dried Bread	10 lb. 10 oz.
Corn Oil	1 lb. 4 oz.
Zinc Phosphide	10 oz.

No. 5

Ground Dried Bread	5 lb.
Corn Oil	10 oz.
Zinc Phosphide	10 oz.
Some Fresh Bait	6 lb. 4 oz.

No. 6

Ground Dried Bread	29 lb. 6 oz.
Ground Fresh Pork Fat	2 lb.
Ground Fresh Halibut	6 lb.
Powdered Thallium Sulphate	10 oz.

No. 7

Ground Dried Bread	18 lb. 2 oz.
Glycerin	1 lb. 4 oz.
Powdered Thallium Sulphate	10 oz.

* Fresh bait has hamburger, or ground sweet potatoes (raw but canned is better), or ground applies, or ground bananas.

Rat Poison for Flour Mills

Sodium Silicofluoride	70 lb.
Diatomaceous Earth	30 lb.

Dust on floor, keeping away from sacks. Rats lick powder off feet and go out seeking water and thus die outside.

Rabbit Poisons

Poisoned Alfalfa. Dissolve 1 oz. of strychnine sulphate in 1 gal. of hot water and sprinkle over 10 lb. of dry alfalfa leaves. Well-formed leaves free from dust or sticks should be used. They should be threshed thoroughly until all the moisture is absorbed. The poisoned leaves should be distributed in small handfuls, in lines a few feet apart, across portions of the field where observations show the rabbits to be feeding. Stock should be excluded.

Poisoned Green Alfalfa (summer poison)

Chopped Green Alfalfa	20 lb.
Strychnine (Powdered Alkaloid)	1 oz.
Saccharine	1/10 oz.

Poisoned Rye Heads. In localities where alfala is not raised, rye, emmer, or wheat heads are excellent mediums for poison, and frequently surpass alfalfa leaves in effectiveness, particularly in dry-land sections. Where possible, grain heads for poisoning should be cut and cured when the grain is in the dough stage, as it is more palatable and attractive to rabbits when cut at this time. Dissolve 1 oz. of strychnine sulphate in 6 qt. of hot water and sprinkle over 10 lb. of grain heads. Mix thoroughly until all moisture is absorbed. The heads should be cut from the stem just below the last kernel and as little straw taken as possible.

Cedar Shingles.

Strychnine (Powdered Alkaloid)	1 oz.
Saccharine	1/8 oz.
Bicarbonate of Soda (Baking Soda)	1 oz.
Flour	3 tbsp.

Mix together dry, 1 oz. of powdered strychnine (alkaloid), 1 oz. of baking soda, 1 teaspoonful of saccharine, and 3 tablespoonfuls of flour. Add a little cold water and stir thoroughly to a smooth, creamy paste. Split the shingles and dip the tops in the paste and stick them into the ground along the rabbit trails and runways. These baits can be easily taken up when they are no longer needed and all danger to stock is thereby eliminated. In many communities this poison has proved very effective.

Starch Formula (Rabbits). Dissolve 2 oz. (heaping tablespoonful) of gloss starch in a little cold water, pour into 2 to 3 quarts of boiling water, and stir until a thin starch paste is formed. Stir into the starch paste 1 oz. of strychnine (alkaloid) until a creamy paste, free from lumps, is formed. Mix the paste thoroughly over 10 lb. of grain heads until every head is coated. The heads should be cut from the stem just below

the last kernel and as little straw taken as possible. Ten pounds of alfalfa leaves or chopped alfalfa may be used in place of grain heads in alfalfa districts.

Rabbit Salt. Mix dry 1 oz. strychnine (alkaloid) with 16 oz. granulated salt. A very satisfactory method is to bore about ⅔ of the way through a short 2″ by 4″ block with 1- to 1½-inch bit and place the salt bait in this container. The blocks should be placed in or near the rabbit trails and runways. Care should be taken in placing these baits so that livestock will not obtain them.

Insect Control in Stored Rice

Fumigate with 2.5 lb. chloropicrin per 1000 cubic feet of space at temperatures above 70° F. or with carbon bisulphide at rate of 6 lb. per 1000 cubic feet.

Ground Squirrel Poison

Mix thoroughly 1 oz. strychnine alkaloid (powdered) and 1 oz. baking soda. Sift this into ¾ pint of thin, hot starch paste and stir to a creamy mass. The starch paste is made by dissolving one heaping tablespoonful of dry gloss starch in a little cold water, which is then added to ¾ pint of boiling water. Boil and stir constantly until a clear thin paste is formed.

Add ¼ pint heavy corn syrup and a tablespoonful of glycerin and stir thoroughly.

Add ⅛ oz. saccharine and stir thoroughly.

Pour this poison solution over 20 quarts of clean oats and mix thoroughly so that each grain of oats is coated. Prepare it 24 to 48 hours before using.

For mixing small quantities an ordinary galvanized wash tub is convenient. For large quantities a tight, smooth box may be used, and mixing may be done with a spade.

A teaspoonful of the poisoned oats should be placed near each ground squirrel hole on clean hard ground letting it scatter slightly as it falls. (Placed in this way it will not endanger stock). Do not put the poisoned grain on the loose dirt of the mound or into the holes. Each quart of the poisoned grain is sufficient to treat about 60 holes.

Squill Paste Preservative

A suitable preservative for the red squill paste is 1% of a hydroxybenzoic acid derivative or ½% of benzoic acid.

White Coal Tar Disinfectant

Cresylic Acid	50 lb.
Cresylic Creosote	6 lb.
Sulphonated Castor Oil	5 lb.
Gelatin	3 lb.
Water	36 lb.

The sulphonated oil and gelatin are dissolved in the water and the mixed tar acids are gradually added to them with vigorous agitation in small quantities at a time. Final treatment with a colloid mill may be necessary to obtain a good dispersion.

Insecticides to Be Applied by Fumigation

German Patent 597,769

Formula No. 1

Naphthalene	40 g.
Naphthalene, Crude	40 g.
Animal Oil	5 cc.
Cresol, Crude	5 cc.
Ceresin	10 g.

No. 2

Naphthalene	15 g.
Naphthalene, Crude	25 g.
Animal Oil	20 cc.
Cresol, Crude	30 cc.
Ceresin	10 g.

No. 3

Naphthalene	10 g.
Naphthalene, Crude	10 g.
Animal Oil	25 cc.
Cresol, Crude	25 cc.
Ceresin	30 g.

Method: Melt naphthalene and ceresin, and add cresol and oil at low temperature. Application on fumigation-pans.

Warehouse Fumigant

Chloropicrin (nitrochloroform, CCl_3-NO_2) is a colorless heavy liquid which is becoming prominent as a fumigant. Due to its highly lachrymatory nature as well as its highly toxic effect on insects, their larvae and eggs, it makes possible effective fumigation without the high possibility of accidental death to operators attendant on the use of hydrogen cyanide.

The following are the recommended quantities in pounds per 1000 cu. ft. of volume to be fumigated using 24-hour exposure and a temperature of 70–80° F. Higher temperatures reduce the exposure time while lower ones increase it. The liquid is vaporized by spraying or evaporation from very shallow pans or soaked cloth.

Confectionery Industry.

	Lb. per 1000 cu. ft.
Candy	1
Nuts	1
Dairy Industry.	
Eggs and Cheese	¼
Milling Industry.	
Macaroni Vaults	1–1¼
Macaroni, Cased	1½–2
Space Fumigation	1
Flour Mills	
General	1
Returned Bags	1½
Sacked Flour	1½
Fly and worm control. (Exposure over the week end)	¼
Rice Bags and Vaults	1½
Box Cars (Adults)	4–5
Box Cars Complete	7–8
Stored Products.	
Warehouse Space	1
Sacked Goods and Vaults	1½
Grain Bins	
(With grain moving at 100 bu. per hr.)	2
Contaminated Bins	3
Tobacco.	
Vaults	2
Warehouses	1¼
Furniture.	
Furniture	1¼
Household.	
Bedbugs, Clothes Moths, Roaches	1
Buffalo Moth	1¼
Rodents	¼

Cod Liver Emulsion for Animals

Formula No. 1

50% Oil

Carragheen Moss	12 g.
Distilled Water	300 g.
Moldex or Other Good Preservative	1 g.
Cod Liver Oil	500 g.
Syrup, White	86 g.
Distilled Water	91 g.
*Spice Oil Mixture	10 g.

No. 2

40% Oil

Gum Arabic	12 g.
Gum Tragacanth	12 g.
Glycerin (28° Bé.)	130 g.
Water, Distilled	340 g.
Sodium Salicylate	5 g.
Cod Liver Oil	400 g.
*Spice Oil Mixture	10 g.
Calcium Hypophosphite	8 g.
Sodium Hypophosphite	12 g.
Water, Distillate	71 g.

No. 3

35% Oil

Carragheen Moss	18 g.
Distilled Water	400 g.
Sodium Formate	5 g.
Cod Liver Oil	350 g.
Syrup, White	100 g.
Distilled Water	117 g.
*Spice Oil Mixture	10 g.

No. 4

30% Oil

Gum Arabic	12 g.
Gum Tragacanth	16 g.
Glycerin (28° Bé.)	140 g.
Distilled Water	430 g.
Moldex or Other Good Preservative	1 g.
Cod Liver Oil	300 g.
*Spice Oil Mixture	10 g.
Calcium Hypophosphite	8 g.
Sodium Hypophosphite	12 g.
Distilled Water	71 g.

No. 5

Gum Arabic	15 g.
Gum Tragacanth	8 g.
Glycerin (28° Bé.)	50 g.
Distilled Water	456 g.
Sodium Formate	5 g.
Iodine	3 g.
Chloroform	3 g.
*Spice Oil Mixture	3 g.
Cod Liver Oil	447 g.

No. 6

Gum Arabic	10 g.
Gum Tragacanth	10 g.
Glycerin (28° Bé.)	200 g.
Water, Distilled	366 g.
Potassium Iodide	3 g.
Moldex or Other Good Preservative	1 g.
Cod Liver Oil	400 g.
*Spice Oil Mixture	10 g.

No. 7

Carragheen Moss	19 g.
Glycerin (28° Bé.)	100 g.
Distilled Water	519 g.
Potassium Iodide	1 g.
Moldex or Other Good Preservative	1 g.
Cod Liver Oil	350 g.
*Spice Oil Mixture	10 g.

No. 8

Gum Arabic	12 g.
Gum Tragacanth	16 g.
Glycerin (28° Bé.)	130 g.
Distilled Water	426 g.
Sodium Salicylate	5 g.

Iodine	1 g.
Alcohol, Absolute	10 g.
Cod Liver Oil	300 g.
Spice Oil Mixture	10 g.
Calcium Hypophosphite	8 g.
Sodium Hypophosphite	12 g.
Distilled Water	70 g.

*Spice Oil Mixtures for Above Emulsions

Formula No. 1

Vermouth Oil	5 cc.
Coriander Oil	2 cc.
Galanga Oil	1 cc.
Gentian Oil	1 cc.
Calamus Oil	0.5 cc.
Peppermint Oil	0.5 cc.

No. 2

Fennel Oil	5 cc.
Calamus Oil	3 cc.
Peppermint Oil	2 cc.

No. 3

Fennel Oil	6 cc.
Calamus Oil	4 cc.

The above emulsions are made up best in enameled kettles with high speed mixers.

Gum Solutions: Wash gum arabic with water at 40° C., then put into cold water and warm to solution. Gum tragacanth or carragheen moss are first wet with glycerin and put into cold water. Soak 12 hours. Prepare gums separately and when ready, mix as indicated, warm up to 90° C. (add Iodide) then add preservative.

Stir in Cod Liver Oil in small portions. Then add Spice Oil Mixture, with stirring. Syrup and Hypophosphites are dissolved in hot water as indicated. Stir into emulsion hot. Iodine is prepared by solution in Alcohol or Chloroform and a little of the Cod Liver Oil, then is added to the gum (aqueous) solutions and emulsified.

When ready, stir vigorously for ½ hour, or put through a homogenizer.

Cod Liver Oil Emulsion for Animals

Formula No. 1

a.	Gum Arabic	100 g.
	Gum Tragacanth	100–120 g.
	Glycerin	1200 g.
b.	Cod Liver Oil, Crude	3700 g.
c.	Calcium Hypophosphite	50 g.
	Sodium Hypophosphite	50 g.
	Water	4000 g.

Grind *a* until smooth, add *b* in small portions, homogenizing every time. To this add *c* in an emulsifying machine.

As spice, add 1% of the following mixture of:

Vermouth Oil	10 cc.
Coriander Oil	4 cc.
Galanga Oil	2 cc.
Gentian Oil	2 cc.
Calamus Oil	1 cc.
Peppermint Oil	1 cc.

No. 2

a.	Iceland Moss	10 g.
	Water (2 portions) to	600 g. Extract
b.	Gum Tragacanth	6 g.
	Gum Arabic	6 g.
	Cod Liver Oil	400 g.
c.	Fennel Oil	5 drops
	Calamus Oil	5 drops

Boil *a* two times (two portions of water) to 600 g. united extract. Grind *b* until homogeneous and transfer into a dry bottle; add *c*, then *a* in two portions, shaking thoroughly and vigorously.

No. 3

a.	Carragheen Moss	10 g.
	Water	350 g.
b.	Cod Liver Oil	500 g.
c.	White Syrup	100 g.
	Malt Extract	20 g.
	Water	120 g.

Soak *a* for 12 hours, boil then about 10–15 min., filter through cloth. Add *b*, while stirring, to this hot solution, then stir in *c*, and add as preservative

Sodium Salicylate	0.3–0.5 g.

No. 4

a.	Gum Tragacanth	5 g.
	Gum Arabic	8 g.
	Water	250 g.
b.	Calcium Chloride	50 g.
	Water	57 g.
c.	Lime Water	230 g.
d.	Cod Liver Oil	400 g.

Soak *a* for 1½–2 days, add *b*, then *c*, mix well, percolate (lumps remaining on the cloth are ground with water and pour again through the filter). Mix the whole well in an emulsifying machine with *d* for hours; *d* is added in 8 portions. The *a*, *b*, *c* is treated alone before.

Skin Abrasion Lotion (For Dogs)

Dissolve 1 part of castile soap in 9 parts of water. Wash dog thoroughly with this solution; and then apply with cotton to the affected parts 5% tincture of iodine.

Moisture Eczema Lotion for Dogs

This lotion is excellent for bathing moist eczema spots on dogs.

Tannic Acid	5 oz.
Salicylic Acid	5 oz.
Alcohol (50%)	90 oz.

Before using this preparation the spots should be thoroughly washed with castile soap.

Dog Eczema Powder

Senega Root Powder	90 oz.
Sodium Sulphite	10 oz.

Rub into skin with water and finally wash off.

Liquid Soap for Dogs and Other Animals

Palm Kernel Oil	1200 g.
Olein	300 g.
Caustic Potash (50%) about	736 g.
Glycerin	600 g.
Softened or Distilled Water	6800 g.
Carbolic Acid (Phenol), Crude	400 g.
Perfume Oil (e.g., Eucalyptus)	50 g.

Dog Deterrent

Naphthalene Flakes	4 oz.
Paraffin Wax	¼ oz.
Gasoline	1–2 pt.
Rosin	¼ oz.

Stir until dissolved; spray on base of tree trunks or shrubs with an insect spray gun.

Dog Nuisance Preventer

To prevent dogs from staining trees and shrubs, spray the base of the latter with a solution of ¼ oz. nicotine sulphate pei gal. water.

Dog Worm Remedy

Formula No. 1

Aloes	45 gr.
Soap	45 gr.
Oleoresin of Male Fern	30 gr.

Mix and make into 2 pills.

Administer both pills in the morning, the animal to remain fasting for some time.

No. 2

Areca nut, freshly ground, is considered an excellent remedy for worms in dogs. About one dram made into a pill is the dose for an ordinary sized dog. This should be given at night followed by a dose of castor oil in the morning.

Animal Eye Washes

One of the best eye washes for irrigation and cleansing of the eye and for purulent discharges and conjunctivitis is as follows:

Sodium Bicarbonate	15 gr.
Borax	15 gr.
Sodium Chloride	15 gr.
Glycerin	1 dr.
Distilled Water	8 oz.

Animal Ear Preparation

Formula No. 1

Gentian Violet	5 oz.
Acetone	5 oz.
Alcohol	45 oz.
Water	45 oz.

Take small amount in an eye dropper and place deep into the ear and remove excess so as not to soil the outside.

No. 2

Phenol	3 oz.
Glycerin	97 oz.

Add boric acid powder until the glycerin will not absorb any more. Let stand over night and strain.

Place one-half eye dropperful in ear and remove the excess.

Dog Mange Treatment

Formula No. 1

Kerosene	32 oz.
Creolin	6 oz.
Oil of Tar	6 oz.
Sulphur	1 lb.
Raw Linseed Oil	to make 1 gal.

Rub into skin every other day. It gives gratifying results.

No. 2

Another good oily skin mixture is:

Gum Camphor	1 lb.
Alcohol	1 pt.
Turpentine	1 qt.
Kerosene	2 qt.
Cotton Seed Oil	6 qt.
Sulphur (Flowers)	9 oz.

Note: First dissolve the camphor in the alcohol. Rub on the skin every third day.

Dog Mouth Wash

Tincture Iron	1 oz.
Potassium Chlorate	2 oz.
Glycerin	4 oz.
Water	to make 1 gal.

Aphrodisiac for Cattle and Horses

The usual doses of yohimbine hydrochloride as an aphrodisiac in veterinary practice are: Stallions, 1 gr.; bulls, 1¼ gr.; cows and mares, 1½ gr. It should be administered in the food or drinking water three times a day.

Cow Abortion Flush

Common Salt	1 lb.
Potable Water	95 lb.

Remove aborting cow from herd. Before returning to herd flush daily with above solution.

Bloody Milk Mixture

Glauber's Salts	1 lb.
Water	4 lb.

Give the above dosage to cow producing bloody milk. Find and remove the cause; it may be udder injury, improper feeding, or overfeeding. Certain bacteria impart a red color to milk; this is uncommon.

Cow Boil Wash

Carbolic Acid Solution (3%)

Syringe out cavity with above solution after lancing and removing contents.

Chapped Teats Solution

Boric Acid Crystals	1 lb.
Water	15 lb.

Bathe teats twice daily with above and dry; then rub teats with vaseline.

Cow Pox Solution

Apply a 4% solution of potassium permanganate after cleaning udder and teats.

Calf Scours Remedy

Salol	1 lb.
Subnitrate of Bismuth	2 lb.

First give the calf with simple scours 1½ oz. of castor oil in ½ pt. of warm milk. After a few hours give a teaspoonful of the above. Repeat this dosage three times daily.

Impaction in Cattle Treatment

Glauber's Salts	1½ lb.
Water	7 lb.

Administer 2 oz. of aromatic spirits of ammonia at once. Two hours later give the above formula.

Egg Preserving Solution

Sodium Silicate	1 fl. oz.
Water	25 fl. oz.

Defeathering Poultry

U. S. Patent 2,017,648

Burgundy Pitch	15 lb.
Montan Wax	5 lb.
Paraffin Wax	10 lb.

The ingredients are melted, thoroughly mixed, and applied to the carcass, preferably after the bird has been scalded and the bulk of the feathers that can be removed hastily have been removed by hand.

After application, the defeathering compound is permitted to solidify by cooling and is then removed, taking with it epidermal excrescences such as feathers, down, pinfeathers and the like.

Prevention of Skin Tearing when Plucking Feathers with Adhesives

Spray the skin with an oil emulsion.

Bird Gravel

Fine River Sand	97.5 g.
Cuttlefish Bone, Powder	2 g.
Pyrethrum Flowers	0.5 g.

Laying Hen Mash Feed

Ration No. 1
(With Milk)

For those who wish to use home-grown grains.

Ground Corn	18 lb.
Ground Barley	18 lb.
Ground Wheat	18 lb.
Ground Oats	18 lb.
Meat Scrap	10 lb.
Dried Milk	10 lb.
Alfalfa Meal	5 lb.
Steamed Bone Meal	2 lb.
Salt	1 lb.

Ration No. 2
(With Milk)

Using wheat by-products.

Ground Corn	20 lb.
Bran	20 lb.
Flour Middlings	12 lb.
Ground Oats	20 lb.
Meat Scrap	10 lb.
Dried Milk	10 lb.
Alfalfa Meal	5 lb.
Steamed Bone Meal	2 lb.
Salt	1 lb.

This is a ration for those who wish to use barley in the laying ration. Barley

is not as palatable as corn when fed whole in the scratch grain but is a valuable ingredient of a laying mash. However, it should be remembered that this grain is low in vitamin ''A'' when compared with corn and that sufficient alfalfa meal should be present to take care of this deficiency.

Ration No. 3
(With Milk)

Ground Barley	20 lb.
Bran	20 lb.
Flour Middlings	10 lb.
Ground Oats	20 lb.
Meat Scrap	10 lb.
Dried Milk	10 lb.
Alfalfa Meal	7 lb.
Steamed Bone Meal	2 lb.
Salt	1 lb.

Ration No. 4
(Without Milk)

Ground Corn	20 lb.
Bran	20 lb.
Flour Middlings	14 lb.
Ground Oats	20 lb.
Meat Scrap	20 lb.
Alfalfa Meal	5 lb.
Salt	1 lb.

Ration No. 5

Many farmers and poultrymen wish to feed a surplus of liquid milk (either skim or buttermilk) to the laying flock. This is a successful practice and the following ration is designed to be fed when liquid milk is given as the only drink. In omitting the water for drinking purposes no fear need be felt as liquid milk is about 90% water. If water is given to the flock in addition to the liquid milk, the meat scrap content should be increased to obtain best results. It should also be remembered that the practice of feeding liquid milk for one or two days and then missing a day is a bad one and a satisfactory production cannot be expected over a long period of time.

Ground Corn	20 lb.
Ground Oats	21 lb.
Ground Barley	21 lb.
Ground Wheat	20 lb.
Meat Scrap	10 lb.
Alfalfa Meal	5 lb.
Steamed Bone Meal	2 lb.
Salt	1 lb.

The above ration may also be used when condensed buttermilk is fed.

Ration No. 6

The following ration is one which has been fed at the Poultry Experiment Station to 1200 laying hens during the past year and the egg production and hatchability obtained have been satisfactory.

Ground Barley	28 lb.
Bran	20 lb.
Ground Oatmeal	11 lb.
Flour Middlings	10 lb.
Meat Scrap	10 lb.
Dried Milk	10 lb.
Alfalfa Leaf Meal	8 lb.
Steamed Bone Meal	2 lb.
Salt	1 lb.

Either dried buttermilk or dried skim milk may be used in making up these laying rations. If one is feeding for eggs alone, any of the foregoing rations will give good results. If good hatchability is desired, rations No. 1, No. 2, No. 3 and No. 6 are recommended.

A satisfactory scratch grain consists of equal parts, by weight, of corn and wheat.

It is important that pullets especially obtain enough scratch grain to keep them in good growing condition. They are under the double strain of egg production and growth. Do not obtain fall and winter eggs from your pullets at the expense of growth as this leads to moult.

Oyster shell should be available to the laying flock at all times.

All-Mash Ration for Laying Hens

Yellow Corn, Coarsely Ground	35 lb.
Wheat, Coarsely Ground or Shorts	30 lb.
Oats, Finely Ground	20 lb.
Wheat Bran, Coarse	7 lb.
Meat Scrap, Medium (50–55% Protein)	10 lb.
Dried Skim Milk or Buttermilk	3 lb.
Alfalfa Meal or Leaf Meal	5 lb.
Salt	0.5 lb.

In addition, for confined layers, use ½ to 1 pt., or amount suggested by manufacturers, of potent cod liver oil or sardine oil to each 100 pounds of mash.

In case it is preferred that grain and mash be fed separately, the following formulas may be used:

Mash Ration

Coarsely Ground Yellow Corn	20 lb.
Wheat, Coarsely Ground or Shorts	20 lb.
Oats, Finely Ground	20 lb.
Wheat Bran, Coarse	9 lb.
Meat Scrap, Medium (50–55% Protein)	20 lb.
Dried Skim Milk or Buttermilk	5 lb.

Alfalfa Meal	5 lb.
Salt	1 lb.
Cod Liver Oil	1 lb.

Grain Ration

Whole Wheat	2 lb.
Whole or Cracked Corn	2 lb.
Whole Oats or Barley	1 lb.

or

Whole Wheat }
Whole or Cracked Corn } equal parts

Egg-Laying Rations

Mixture No. 1

Mash:

Corn Meal	16 lb.
Meat Scrap	6 lb.
Bran	1 lb.
Middlings	1 lb.

Scratch Mixture:

Cracked Corn	1 lb.
Wheat	1 lb.

No. 2

Mash:

Barley Meal	2 lb.
Bran	1 lb.
Middlings	1 lb.
Fish Scrap	1 lb.

Scratch Mixture:

Cracked Corn	1 lb.
Wheat	1 lb.

With the above mixtures supply some green feed. Feed scratch mixture twice daily and sparingly. Feed scratch mixture early in the morning and late in the afternoon. Mash may be fed dry or wet.

Chick Feed

Yellow Corn Meal (Ground Coarsely)	360 lb.
Bran	200 lb.
Ground Oatmeal	200 lb.
Skim Milk Powder	100 lb.
Meat Scrap	50 lb.
Alfalfa Leaf Meal	50 lb.
Steamed Bonemeal	20 lb.
Salt	10 lb.
Cod Liver Oil	1 lb.

Chick Starter Feed

Yellow Corn, Coarsely Ground	50 lb.
Coarsely Ground Wheat or Middlings	20 lb.
Wheat Bran	10 lb.
Meat Scrap (50–55% Protein)	10 lb.
Dried Skim Milk or Buttermilk	5 lb.
Alfalfa Meal or Leaf Meal	5 lb.
Cod Liver Oil	1 lb.

Ration for Fattening Chickens

Formula No. 1

Finely Ground Corn	12 lb.
Wheat Bran	4 lb.
Wheat Middlings	4 lb.
Meat Scrap	1 lb.

No. 2

Finely Ground Oats	15 lb.
Finely Ground Corn	15 lb.
Low Grade Flour	2 lb.
Bran	1 lb.

To fatten chickens, feed one of the above mixtures 3 times daily. Food should be made soft with buttermilk or skim milk.

Breeding Flock Ration

Mash:

Bran	1 lb.
Middlings	1 lb.
Corn Meal	3 lb.
Meat Scrap	1½ lb.
Ground Oats	1 lb.
Rolled Oats	1 lb.
Linseed Meal	½ lb.

Scratch Mixture:

Cracked Corn	1 lb.
Wheat	1 lb.

Keep breeding stock outdoors every good day throughout the year. Supply abundance of green feed. Feed scratch feed in deep litter to make hens exercise. Fertile eggs can be produced by not forcing the hens with food, and by keeping vigorous males also well fed.

Poultry Appetite Stimulant

Pulverized Gentian	1 lb.
Pulverized Ginger	¼ lb.
Pulverized Saltpeter	¼ lb.
Pulverized Iron Sulphate	½ lb.
Pulverized Nux Vomica	¼ lb.

Add 1 oz. of the preparation to each 5 lb. of mash.

Poultry Coccidiosis Feed

Dry Skim Milk or Buttermilk	40 lb.
Wheat Bran	10 lb.
Yellow Corn Meal	30 lb.
Ground Barley	20 lb.
Ferrous Sulphate	¼ lb.

Powder for Hens to Increase Egg Production

Formula	No. 1	No. 2	No. 3
	g.	g.	g.
Dicalcium Phosphate, Precipitated	72	70	—
Calcium Carbonate	—	—	60
Ferrous Sulphate, Powder	12	10	—
Ferrous Oxide, Powder	—	—	10
Black Pepper, Ground	6	—	5
Ginger Root, Powder	—	20	10
Gentian Root, Powder	10	—	—
Stinging Nettle Seed	—	—	15

Harrison Test Cow Feed

This is the formula recommended by Cornell University for test cows. It can be successfully used with second cutting alfalfa or second cutting timothy and clover.

Formula No. 1

Distillers Grain (9% Fat)	300 lb.
Wheat Bran	400 lb.
Hominy or Corn Meal	400 lb.
Ground Oats	370 lb.
Coconut Oil Meal	300 lb.
Linseed Oil Meal	200 lb.
Steam Bone Meal	20 lb.
Salt	10 lb.

(18% protein feed.)

No. 2

Soybean Feed

This can be successfully fed with good hay.

Ground Oats	900 lb.
Ground Soybeans	100 lb.

Fattening Powder for Pigs

Formula	No. 1	No. 2	No. 3
	g.	g.	g.
Salt	11	20	10
Antimony Sulphide (Sb_2S_3 crude)	10	10	—
Sulphur Flowers	11	10	—
Glauber's Salt, Crystallized	11	20	10
Sodium Bicarbonate	21	—	—
Trigonella Seed	16	10	20
Linseed Meal	20	—	—
Fennel, Pulverized	—	10	—
Gentian Root Powder	—	10	13
Juniper Berries, Dry, Powder	—	10	20
Calamus, Powder	—	—	14

Milk-Increasing Powder for Cows

Formula No. 1

Calcium Carbonate	50 g.
Caraway Seed	30 g.
Calamus, Powder	20 g.

No. 2

Dicalcium Carbonate, Precipitated	40 g.
Caraway Seed	20 g.
Calamus, Powder	20 g.
Trigonella Seed	20 g.

Goat Feeds

1. Ground Feed for Bucks

Ground Corn	100 lb.
Ground Oats	100 lb.
Bran	50 lb.
Linseed Meal	25 lb.

Feed at rate of 1½ lb. per buck daily; increase to 2 lb. during breeding season. Include 3 lb. of alfalfa or clover hay, and a pound of turnips with the ration of ground feed.

2. Vorhies Grain Mixtures for Does

I.

Rolled Barley	100 lb.
Wheat Bran	100 lb.
Dried Beet Pulp	100 lb.
Coconut Oil	100 lb.

Feed 1 to 2 lb. per doe daily along with hay and mangels.

II.

Dried Beet Pulp	600 lb.
Rolled Barley	100 lb.
Wheat Bran	100 lb.
Coconut Oil	200 lb.

Feed 1 to 2 lb. per doe daily along with hay and turnips.

III.

Dried Beet Pulp	100 lb.
Wheat Bran	100 lb.
Oats	100 lb.
Coconut Meal	100 lb.

Feed 1 to 2 lb. per doe per day along with hay and turnips or silage.

IV.

Dried Beet Pulp	300 lb.
Rolled Barley	100 lb.
Wheat Bran	100 lb.

Feed 1 to 2 lb. per doe per day along with hay and mangels.

California Kid Feed Formula

Rolled Barley	100 lb.
Ground Oats	100 lb.

Feed ¼ to ½ lb. daily per kid after two weeks of age. Allow animals to eat hay, and give milk.

Feeding Lime for Animals

Formula	No. 1	No. 2	No. 3
	g.	g.	g.
Dicalcium Phosphate, Precipitated	65	70	80
Salt	10	—	5
Licorice Root, Powder	6	9	3
Calamus, Pulverized	4	4	3
Fennel, Ground Finely	4	4	3
Juniper Berries, Dry, Powder	4	3	3
Trigonella Seed	7	9	3

Pasture Seed Mixture

Formula No. 1

Timothy	40 lb.
Alsike Clover	20 lb.
Kentucky Bluegrass	20 lb.
White Clover	20 lb.
Orchard Grass	20 lb.
Redtop	20 lb.
Meadow Fescue	20 lb.

The above formula is used for seeding pastures not to be hayed. Use 16 lb. of formula per acre.

No. 2

For Wet and Unproductive Land

Alsike Clover	20 lb.
Canada Bluegrass	40 lb.
White Clover	20 lb.
Orchard Grass	40 lb.
Redtop	40 lb.

Use 16 lb. per acre.

No. 3

Timothy	80 lb.
Red Clover	20 lb.
Alsike Clover	20 lb.
Kentucky Bluegrass	20 lb.
White Clover	20 lb.
Redtop	20 lb.
Orchard Grass	20 lb.

Use 20 lb. per acre. For a year or two the field should be hayed. After that when the plants are firmly established it should be pastured.

Garden Fertilizer

Nitrate of Soda	135 lb.
Sulphate of Ammonia	200 lb.
Animal Tankage	250 lb.
Superphosphate	1000 lb.
Muriate of Potash	200 lb.
Filler	215 lb.

Fertilizer

Formula No. 1

French Patent 779,281

Calcium Phosphate	75 lb.
Gypsum	20 lb.
Sulphur	5 lb.

No. 2

U. S. Patent 1,931,296

Roast following mixtures for 30 minutes at 315–425° F.

a.	Rock Phosphate	40 lb.
	Lime	10 lb.
	Salt	2½ lb.
b.	Coal	35 lb.
	Salt	2½ lb.

Grind above with

Ammonium Sulphate 10 lb.

No. 3

British Patent 410,487

Moist Sewage Sludge	50 lb.
Chalk	15 lb.
Slaked Lime	5 lb.
Dust, Refuse, Etc.	30 lb.

No. 4

U. S. Patent 2,019,713

Ammonium nitrate and ammoniated triple superphosphate in the proportions of about 45 to 60 parts of ammonium nitrate to 55 to 40 parts of ammoniated triple superphosphate.

Plant Food

Trisodium Phosphate	2 oz.
Potassium Sulphate	2 oz.
Sodium Nitrate	3 oz.

Grind together and mix well. Only about a half gram of the above mixture should be used per plant every month or two. Caution: Using too much of any plant food is dangerous.

House Plant Food

Potassium Nitrate (Saltpeter)	3 oz.
Tribasic Sodium Phosphate	2 oz.

Mix, and dissolve about one tablespoon to the gallon. Of this solution, use one gill for each average size plant, once every two weeks.

Alkali Farm Land Treatment

"Alkali" spots on western farm land are usually due to the presence of sodium clay. Finely pulverized gypsum (calcium sulphate), thoroughly worked into the soil

over a period of a year, will usually prove an effective remedy.

Detecting Treated Grains

Limed grain may be easily detected by the red color developed when it is dropped into a dilute solution of phenolphthalein.

Sulphur bleached grain may be detected by the dark color developed when it is dropped into a dilute solution of lead acetate or lead nitrate.

Delinting Cotton Seed

Seed having a moisture content of 7 to 10% is treated with hydrochloric acid (2% on weight of seed) up to 60° E for 7 minutes. Treatment at 20° E requires 15 to 30 minutes.

Ice Cream

Formulas are presented for seven series of ice-cream mixes containing 20 to 50% cream, showing the proportions of whole, skimmed, condensed, or dried milk that must be mixed in various combinations to produce the desired percentage of solids in the ice cream. These formulas show the ratios of milk fat to serum solids which are commonly used for different types of ice cream.

In Tables 1 to 5, the formulas contain the following dairy products, with 15% sugar added to the mixtures and 0.3% gelatin:

(1) Cream, skim milk, and whole milk.
(2) Cream, unsweetened condensed skim milk, and either skim milk or whole milk.
(3) Cream, dry skim milk, and either skim milk or whole milk.
(4) Cream, sweetened condensed whole milk and skim milk.
(5) Cream mixed with 50% butter, to which mixture is added either dry or unsweetened condensed skim milk, making ice cream containing about 6 to 11% butter.

Tables 6 and 7 show combinations of dairy products without the addition of sugar which are suitable for basic mixes in milk plants for shipment to ice cream manufacturers. In each case, 15 lb. of sugar should be added to each 85 lb. of the unsweetened mix, in order to make a palatable commercial product. The dairy products used in these two tables are:

(6) Cream, unsweetened condensed skim milk, and either whole or skim milk.
(7) Cream, dried skim milk, and either whole or skim milk.

For each of these formulas there are given:

(A) Percentage of solid constituents desired in the ice cream to produce ice cream containing 10 to 18% fat, from 20 to 50% ice cream;
(B) Groups of ingredients which may be used in making comparable ice creams of the same solids content;
(C) The percentages by weight of each of the different milk products required to give a mixture of the desired solids content.

The quantity of each ingredient needed for different size batches of the various mixtures can easily be determined by multiplying the quantity of the total mixture desired in pounds, by the percentages given in the tables.

The flavor and texture of ice cream will vary according to the proportion of milk solids, sugar, gelatin, and flavoring materials present, and the quality of the ingredients used. Ice-cream makers should therefore be careful to select ingredients and ice-cream formula of character and type best suited to their trade, and should check the accuracy of their figures in proportioning each mixture.

Ice Cream

Formula No. 1

100 lb. Mix—8% Fat—Cream, Whole Milk and Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	6 lb.
Cream (30%)	18.5 lb.
Milk (4%)	63 lb.

No. 2

8% Fat—Cream Skim Milk, Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	6 lb.
Cream (30%)	26.7 lb.
Skim Milk	55.8 lb.

No. 3

8% Fat—Sweet Butter, Whole Milk, Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	6 lb.
Butter (84%)	6 lb.
Milk (4%)	75.5 lb.

No. 4

8% Fat—Sweet Butter, Skim Milk, Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	6 lb.
Butter (84%)	9.6 lb.
Skim Milk	72 lb.

TABLE 1.—Amounts of Cream of Different Fat Content and Either Skim Milk or Whole Milk Necessary for Making Different Types of Ice Cream

A. Solids

	Types of Ice Cream				
	a Per Cent	*b* Per Cent	*c* Per Cent	*d* Per Cent	*e* Per Cent
Fat	14	16	16	17	18
Serum Solids	6.39	6.30	6.21	6.12	6.03
Sugar	15.00	15.00	15.00	15.00	15.00
Gelatin	0.3	0.3	0.3	0.3	0.3
Total Solids	35.69	36.60	37.51	38.42	39.33

B. Ingredients	Per cent fat	C. Percentage of Ingredient by Weight in Each Type of Ice Cream Mixture				
		a	*b*	*c*	*d*	*e*
1 Cream	50	28.00	30.00	32.00	34.00	36.00
Skim Milk	0	57.00	55.00	53.00	51.00	49.00
2 Cream	40	35.00	37.50	40.00	42.50	45.00
Skim Milk	0	50.00	47.50	45.00	42.50	40.00
3 Cream	30	46.75	50.00	53.50	56.75	60.00
Skim Milk	0	38.25	35.00	31.50	28.25	25.00
4 Cream	20	70.00	75.00	80.00	85.00	——
Skim Milk	0	15.00	10.00	5.00	——	——
5 Cream	50	23.00	25.25	27.50	29.75	32.00
Whole Milk	4	62.00	59.75	57.50	55.25	53.00
6 Cream	40	29.5	32.25	35.00	37.75	40.50
Whole Milk	4	55.5	52.75	50.00	47.25	44.50
7 Cream	30	40.75	44.75	48.50	52.50	56.50
Whole Milk	4	44.25	40.25	36.50	32.50	28.50
8 Cream	20	66.75	72.50	78.75	85.00	——
Whole Milk	4	18.25	12.50	6.25	——	——
Add to each above combination:						
Sugar		15.00	15.00	15.00	15.00	15.00
Gelatin		0.3	0.3	0.2	0.3	0.3
Total		100.00	100.00	100.00	100.00	100.00

Note: Ice creams made from these formulas whip and freeze slowly, and are likely to develop a buttery consistency, especially if the temperature is not kept fairly constant during storage in the hardening room or cabinet. The use of homogenized cream or mix will prevent undesirable fat clumping in freezing. Aging of the mixes for 24 hours at 40–50° F. before freezing will improve the texture. The cream flavor will be especially noticeable in the high-fat ice creams, hence care should be taken to use only high-grade cream. Melting will be accompanied by leaking of a milky serum from the ice and whipped cream structure of these ice creams, which keep their original form to a considerable extent instead of melting in a homogeneous mass. This is a natural characteristic of straight-cream ice creams, and does not constitute a defect.

No. 5

8% Fat—Sweet Butter, Skim Milk Powder, Water, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Butter (84%)	9.6 lb.
Skim Milk Powder	13.2 lb.
Water	64.7 lb.

No. 6

8% Fat—Cream, Whole Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	6 lb.
Cream (25%)	23 lb.
Milk (4%)	56.5 lb.

TABLE 2.—Amounts of Cream of Different Fat Content; Unsweetened Condensed Skim Milk, and Fresh Skim Milk or Whole Milk Necessary for Making Different Types of Ice Cream

A. Solids		Types of Ice Cream *a* Per Cent	*b* Per Cent	*c* Per Cent	*d* Per Cent	*e* Per Cent
Fat		10	12	14	16	18
Serum Solids		11	10	9	8	7
Sugar		15	15	15	15	15
Gelatin		0.3	0.3	0.3	0.3	0.3
Total Solids		36.3	37.3	38.3	39.3	40.3
B. Ingredients	Per cent fat	C. Percentage of Ingredient by Weight in Each Type of Ice Cream Mixture				
		a	*b*	*c*	*d*	*e*
1 Cream	50	20.00	24.00	28.00	32.00	36.00
Skim Milk	0	41.00	42.50	42.50	43.00	43.75
2 Cream	40	25.00	30.00	35.00	40.00	45.00
Skim Milk	0	36.00	36.50	35.50	35.00	34.75
3 Cream	30	33.30	40.00	46.70	53.40	60.00
Skim Milk	0	27.70	26.50	29.80	21.60	19.75
4 Cream	20	50.00	60.00	70.00	——	——
Skim Milk	0	11.00	6.50	0.50	——	——
5 Cream	50	16.5	20.50	24.50	28.25	32.50
Whole Milk	4	44.5	46.00	46.00	46.75	47.25
6 Cream	40	21.0	26.00	31.25	36.25	41.25
Whole Milk	4	40.0	40.50	39.25	38.75	38.50
7 Cream	30	29.0	36.00	43.25	50.00	57.00
Whole Milk	4	32.0	30.50	27.25	25.00	22.75
8 Cream	20	48.0	58.50	70.0	——	——
Whole Milk	4	13.0	8.00	0.5	——	——
Add to each above combination						
Unsweetened Condensed Skim Milk*		24.00	18.5	14.5	10.00	5.25
Sugar		15.0	15.0	15.0	15.00	15.00
Gelatin		0.3	0.3	0.3	0.3	0.3
Total		100.0	100.0	100.0	100.0	100.0

* Concentration, 3 to 1; contains 27% solids.

Note: The proportions given in columns *a* and *b* represent medium-fat ice creams commonly produced for soda fountain trade. These types of ice cream usually have a very smooth texture. The increased serum solids are derived chiefly from concentrated milk products. In some cases about 90% of the serum solids are added in the form of condensed skim milk, which means that approximately one-third of the mixture is condensed milk and one-fifth is cream testing 40 per cent fat. The cream flavor may be largely masked by the condensed-milk flavor, particularly if the latter has a pronounced cooked flavor. Consequently, the flavor will be improved by using either whole or skim milk with a minimum quantity of condensed skim milk.

The proportions given in columns *c, d,* and *e* represent ice creams with smaller additions of serum solids in the form of condensed skim milk, than those shown in columns *a* and *b*. It is believed that a small addition of serum solids to the higher fat products will improve the original texture, and in preventing deterioration of texture during storage.

TABLE 3.—Amounts of Cream of Different Fat Content, Dry Skim Milk, and Fresh Skim Milk or Whole Milk Necessary for Making Different Types of Ice Cream

A. Solids	Types of Ice Cream *a* Per Cent	*b* Per Cent	*c* Per Cent	*d* Per Cent	*e* Per Cent
Fat	10	12	14	16	18
Serum Solids	11	10	9	8	7
Sugar	15	15	15	15	15
Gelatin	0.3	0.3	0.3	0.3	0.3
Total Solids	36.3	37.3	38.3	39.3	40.3

	B. Ingredients	Per cent fat	C. Percentage of Ingredient by Weight in Each Type of Ice Cream Mixture *a*	*b*	*c*	*d*	*c*
1	Cream	50	20.00	24.00	28.00	32.00	36.00
	Skim Milk	0	60.00	37.00	54.00	51.00	48.00
2	Cream	40	25.00	30.00	35.00	40.00	45.00
	Skim Milk	0	55.00	51.00	47.00	43.00	39.00
3	Cream	30	33.25	40.00	46.75	53.25	60.00
	Skim Milk	0	46.75	41.00	35.25	29.75	24.00
4	Cream	20	50.00	60.00	70.00	80.00	——
	Skim Milk	0	30.00	21.00	12.00	3.00	——
5	Cream	50	15.00	19.00	23.50	27.57	32.00
	Whole Milk	4	65.00	62.00	58.50	55.43	52.00
6	Cream	40	19.00	24.50	30.00	35.25	40.75
	Whole Milk	4	61.00	56.50	52.00	47.75	43.25
8	Cream	20	26.25	33.75	41.50	48.75	56.50
	Whole Milk	4	53.75	47.25	40.50	34.25	27.50
7	Cream	30	42.50	54.75	67.00	79.25	——
	Whole Milk	4	37.50	26.25	15.00	3.75	——
	Add to each above combination						
	Dry Skim Milk		5.00	4.00	3.00	2.00	1.00
	Sugar		15.00	15.00	15.00	15.00	15.00
	Gelatin		0.3	0.3	0.3	0.3	0.3
	Total		100.00	100.00	100.00	100.00	100.00

Note: Dry skim milk is a very convenient form of serum solids to use in the manufacture of ice cream. Tests reported in U. S. Department of Agriculture Circular 179 have shown that the addition of dry skim milk will produce a medium grade ice cream equal to ice creams made with condensed milk. The principal criticisms of ice creams containing dry skim milk are usually due to the flavor imparted by this product. The formulas given in the above table will reduce this difficulty to a minimum by using as much whole and skim milk as possible in the preparation of the mixes.

No. 7

8% Fat—Cream, Skim Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	6 lb.
Cream (25%)	20 lb.
Skim Milk	59.5 lb.

No. 8

8% Fat—Sweet Butter, Whole Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	6 lb.
Butter (84%)	6.1 lb.
Milk (4%)	73.4 lb.

TABLE 4.—Amounts of Cream of Different Fat Content, Skim Milk, and Sweetened Condensed Whole Milk Necessary for Making Different Types of Ice Cream

A. Solids	Types of Ice Cream a Per Cent	b Per Cent	c Per Cent	d Per Cent	e Per Cent
Fat	10	12	14	16	18
Serum Solids	11	10	9	8	7
Sugar	15	15	15	15	15
Gelatin	0.3	0.3	0.3	0.3	0.3
Total Solids	36.3	37.3	38.3	39.3	40.3

B. Ingredients		Per cent fat	C. Percentage of Ingredient by Weight in Each Type of Ice Cream Mixture a	b	c	d	e
1	Cream	50	16.00	20.68	25.6	30.4	35.2
	Skim Milk	0	50.50	49.72	49.2	48.8	46.9
2	Cream	40	20.00	26.00	32.0	38.0	44.25
	Skim Milk	0	46.50	44.40	42.8	41.2	37.85
3	Cream	30	26.66	34.7	42.7	50.7	58.7
	Skim Milk	0	39.84	35.70	32.1	28.5	23.4
4	Cream	20	40.00	52.0	64.0	76.0	—
	Skim Milk	0	26.50	18.4	10.8	3.2	—
Add to each above combination							
Sweetened Condensed Whole Milk*			25.00	20.00	15.00	10.00	5.00
Sugar			4.5	6.6	8.7	10.8	12.9
Water			4.0	3.0	1.5	—	—
Gelatin			0.3	0.3	0.3	0.3	0.3
Total			100.0	100.0	100.0	100.0	100.0

* Contains 8% fat, 23% serum solids, and 42% sugar.

Note: Before using these formulas the manufacturer should be certain that the analysis of the sweetened condensed whole milk conforms to the analysis used in compiling this table.

No. 9

8% Fat—Sweet Butter, Skim Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	6 lb.
Butter (84%)	9.6 lb.
Skim Milk	69.9 lb.

No. 10

8% Fat—Sweet Butter, Water, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Butter (84%	9.6 lb.
Skim Milk Powder	12.6 lb.
Water	63.3 lb.

No. 11

8% Fat—Cream and Milk, Condensed Skim Milk 27% Solids, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Condensed Milk	30 lb.
Cream (25%)	28 lb.
Milk (4%)	27.5 lb.

No. 12

8% Fat—Cream, Milk, Sweet Condensed Whole Milk, 14% Sugar.

Sugar	2.8 lb.
Gelatin	0.5 lb.
Sweet Condensed Milk	28 lb.
Cream (25%)	15 lb.
Milk (4%)	53.7 lb.

No. 13

8% Fat—Sweet Butter, Skim Milk and Sweet Condensed Skim Milk, 14% Sugar.

Sugar	2.8 lb.
Gelatin	0.5 lb.
Condensed Skim Milk	28 lb.
Sweet Butter	9.6 lb.
Skim Milk	59.1 lb.

TABLE 5.—Amounts of Cream with 50% of the Fat Added in the Form of Butter, Unsweetened Condensed Skim Milk, and Dry Skim Milk Necessary for Making Different Types of Ice Cream

A. Solids

	Types of Ice Cream				
	a	*b*	*c*	*d*	*e*
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Fat	10	12	14	16	18
Serum Solids	11	10	9	8	7
Sugar	15	15	15	15	15
Gelatin	0.3	0.3	0.3	0.3	0.3
Total Solids	36.3	37.3	38.3	39.3	40.3

B. Ingredients	Per cent fat	C. Percentage of Ingredient by Weight in Each Type of Ice Cream Mixture				
		a	*b*	*c*	*d*	*e*
1 Cream	40	12.50	15.00	17.50	20.00	22.50
Unsweetened Condensed Skim Milk*		28.00	34.00	30.00	26.00	22.00
Water		28.40	28.68	28.96	29.25	29.53
2 Cream	40	12.50	15.00	17.50	20.00	22.50
Dry Skim Milk†		10.80	9.67	8.51	7.60	6.25
Water		55.60	53.01	50.45	47.65	45.28
3 Cream	20	25.00	30.00	35.00	40.00	45.00
Unsweetened Condensed Skim Milk*		34.00	29.00	24.00	19.00	14.00
Water		19.00	18.68	17.46	16.25	15.03
4 Cream	20	25.00	30.00	35.00	40.00	45.00
Dry Skim Milk†		9.60	8.25	6.25	5.38	6.00
Water		44.30	39.43	35.21	29.87	23.03
Add to each above combination						
Butter	82	6.10	7.32	8.54	9.75	10.97
Sugar		15.00	15.00	15.00	15.00	15.00
Gelatin		0.3	0.3	0.3	0.3	0.3
Total		100.0	100.0	100.0	100.0	100.0

* Concentration ratio, 3 to 1; contains 27% solids.
† 95% solids.

Note: In the preparation of ice cream mixes with butter only the freshest and best grades of unsalted butter should be used.

No. 14

8% Fat—Cream, Milk, Evaporated Milk, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Evaporated Milk (8%)	30 lb.
Cream (25%)	16 lb.
Milk (4%)	39.5 lb.

No. 15

10% Fat—Cream, Whole Milk, Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	5 lb.
Cream (30%)	26 lb.
Milk (4%)	56.5 lb.

No. 16

10% Fat—Cream, Skim Milk, Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	5 lb.
Cream (25%)	40 lb.
Skim Milk	42.5 lb.

No. 17

10% Fat—Sweet Butter, Whole Milk, Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	6 lb.
Butter (84%)	9 lb.
Milk (4%)	72.5 lb.

TABLE 6.—Amounts of Cream of Different Fat Content, Unsweetened Condensed Skim Milk and Fresh Whole or Skim Milk Necessary for Making Different Types of Mixes Without Sugar

A. Solids	Types of Ice Cream *a* Per Cent	*b* Per Cent	*c* Per Cent	*d* Per Cent	*e* Per Cent
Fat	10	12	14	16	18
Serum Solids	11	10	9	8	7
Sugar	15	15	15	15	15
Gelatin	0.3	0.3	0.3	0.3	0.3
Total Solids	36.3	37.3	38.3	39.3	40.3

B. Ingredients		Per cent fat	C. Percentage of Ingredient by Weight in Each Type of Ice Cream Mixture *a*	*b*	*c*	*d*	*e*
1	Cream	50	23.50	28.25	33.00	37.75	42.50
	Skim Milk	0	48.75	49.25	49.75	50.25	50.50
2	Cream	40	29.5	35.25	41.25	47.00	53.00
	Skim Milk	0	42.75	42.25	41.50	41.00	40.00
3	Cream	30	39.25	47.00	55.00	62.75	70.5
	Skim Milk	0	33.00	30.50	27.75	25.25	22.5
4	Cream	20	58.75	70.50	82.50	——	——
	Skim Milk	0	13.50	7.00	0.25	——	——
5	Cream	50	19.25	24.00	28.75	33.25	38.00
	Whole Milk	4	53.00	53.50	54.00	54.75	55.00
6	Cream	40	24.75	30.75	36.75	42.50	48.50
	Whole Milk	4	47.50	46.75	46.00	45.50	44.50
7	Cream	30	34.00	42.50	50.75	59.00	67.25
	Whole Milk	4	38.25	35.00	32.00	29.00	25.75
8	Cream	20	55.50	69.00	82.25	——	——
	Whole Milk	4	16.75	8.50	0.50	——	——
Add to each above combination							
Unsweetened Condensed Skim Milk*			27.75	22.50	17.25	12.00	7.00
Gelatin			0.34	0.34	0.34	0.34	0.34
Total			100.0	100.0	100.0	100.0	100.0

*Concentration ratio, 3 to 1; contains 27% solids.

Note: Ice cream mixes made from the formulas in Tables 6 and 7 should not be confused with mixes containing sugar. For every 100 pounds of ice cream desired use 85 pounds of mix and add 15 pounds of sugar. In case the manufacturer desires to use 1 or 2 pounds more or less of sugar, the basic formulas will not be materially changed.

No. 18

10% Fat—Sweet Butter, Skim Milk Powder, Water, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	6 lb.
Butter (84%)	12 lb.
Skim Milk	69.5 lb.

No. 19

10% Fat—Sweet Butter, Skim Milk Powder, Water, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Butter (84%)	12 lb.
Skim Milk Powder	12 lb.
Water	63.5 lb.

TABLE 7.—Amounts of Cream of Different Fat Content, Dry Skim Milk and Fresh Skim or Whole Milk Necessary for Making Different Types of Mixes Without Sugar

A. Solids	Types of Ice Cream *a* Per Cent	*b* Per Cent	*c* Per Cent	*d* Per Cent	*e* Per Cent
Fat	10	12	14	16	18
Serum Solids	11	10	9	8	7
Sugar	15	15	15	15	15
Gelatin	0.3	0.3	0.3	0.3	0.3
Total Solids	36.3	37.3	38.3	39.3	40.3

B. Ingredients		Per cent fat	C. Percentage of Ingredient by Weight in Each Type of Ice Cream Mixture *a*	*b*	*c*	*d*	*e*
1	Cream	50	23.52	28.22	32.94	37.64	42.35
	Skim Milk	0	70.69	66.14	63.47	60.04	56.38
2	Cream	40	29.40	35.27	41.17	47.05	52.92
	Skim Milk	0	64.81	60.09	55.24	50.63	45.81
3	Cream	30	39.20	47.03	54.90	62.73	70.57
	Skim Milk	0	55.01	48.33	41.51	34.95	28.16
4	Cream	20	58.80	70.55	82.35	94.10	——
	Skim Milk	0	35.41	24.81	14.06	3.58	——
5	Cream	50	17.40	22.36	27.50	32.50	37.50
	Whole Milk	4	76.81	73.00	68.91	65.18	61.23
6	Cream	40	22.27	28.60	35.00	41.50	49.00
	Whole Milk	4	71.94	66.76	61.41	56.18	49.73
7	Cream	30	30.77	39.60	48.50	57.50	66.25
	Whole Milk	4	63.44	55.76	47.91	40.18	32.48
8	Cream	20	50.0	64.26	78.75	93.25	——
	Whole Milk	4	44.21	33.10	17.66	4.43	——
Add to each above combination							
Dry Skim Milk*			5.79	4.64	3.59	2.32	1.27
Gelatin			0.34	0.34	0.34	0.34	0.34
Total			100.0	100.0	100.0	100.0	100.0

*Contains 95% solids.

No. 20

10% Fat—Cream, Whole Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	4 lb.
Cream (30%)	26 lb.
Milk (4%)	55.5 lb.

No. 21

10% Fat—Cream, Skim Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	4 lb.
Cream (25%)	40 lb.
Skim Milk	41.5 lb.

No. 22

10% Fat—Sweet Butter, Whole Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	4 lb.
Butter (84%)	9 lb.
Milk (4%)	72.5 lb.

No. 23

10% Fat—Sweet Butter, Skim Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	4 lb.
Sweet Butter (84%)	12 lb.
Skim Milk	69.5 lb.

No. 24

10% Fat—Sweet Butter, Skim Milk Powder, Water, 14% Sugar.

Sugar	14	lb.
Gelatin	0.5	lb.
Butter (84%)	12	lb.
Skim Milk Powder	10.6	lb.
Water	62.9	lb.

No. 25

10% Fat—Cream, Milk Condensed Skim Milk (27%), 14% Sugar

Sugar	14	lb.
Gelatin	0.5	lb.
Condensed Milk	18	lb.
Cream (30%)	28	lb.
Milk (4%)	39.5	lb.

No. 26

10% Fat—Cream and Milk, Sweet Condensed Whole Milk, 14% Sugar.

Sugar	6.8	lb.
Gelatin	0.5	lb.
Condensed Milk	18	lb.
Cream (25%)	27	lb.
Milk (4%)	47.7	lb.

No. 27

10% Fat—Sweet Butter, Skim Milk and Sweet Condensed Skim Milk, 14% Sugar.

Sugar	14	lb.
Gelatin	0.5	lb.
Butter (84%)	12	lb.
Condensed Skim Milk	16	lb.
Skim Milk	57.5	lb.

No. 28

10% Fat—Cream, Milk Evaporated Milk, 14% Sugar.

Sugar	14	lb.
Gelatin	0.5	lb.
Evaporated Milk	18	lb.
Cream (25%)	28	lb.
Milk (4%)	39.5	lb.

No. 29

12% Fat—Cream, Whole Milk, Skim Milk Powder, 12% Sugar.

Sugar	12	lb.
Gelatin	0.5	lb.
Skim Milk Powder	2	lb.
Cream (25%)	41	lb.
Milk (4%)	44	lb.

No. 30

12% Fat—Cream, Skim Milk, Skim Milk Powder, 12% Sugar.

Sugar	12	lb.
Gelatin	0.5	lb.
Skim Milk	3	lb.
Cream (30%)	40	lb.
Skim Milk	44.5	lb.

No. 31

12% Fat—Sweet Butter, Whole Milk, Skim Milk Powder, 12% Sugar.

Sugar	12	lb.
Gelatin	0.5	lb.
Skim Milk Powder	3	lb.
Butter (84%)	10.8	lb.
Milk (4%)	73.7	lb.

No. 32

12% Fat—Sweet Butter, Skim Milk and Skim Milk Powder, 12% Sugar.

Sugar	12	lb.
Gelatin	0.5	lb.
Skim Milk Powder	3	lb.
Butter (84%)	14.3	lb.
Skim Milk	70.2	lb.

No. 33

12% Fat—Sweet Butter, Skim Milk Powder, Water, 12% Sugar.

Sugar	12	lb.
Gelatin	0.5	lb.
Butter (84%)	14.3	lb.
Skim Milk Powder	9.5	lb.
Water	63.7	lb.

No. 34

12% Fat—Cream, Whole Milk, Skim Milk Powder, 14% Sugar.

Sugar	14	lb.
Gelatin	0.5	lb.
Skim Milk Powder	2	lb.
Cream (25%)	41.5	lb.
Milk (4%)	42	lb.

No. 35

12% Fat—Cream, Skim Milk Powder, 14% Sugar.

Sugar	14	lb.
Gelatin	0.5	lb.
Skim Milk Powder	2	lb.
Cream (30%)	40	lb.
Skim Milk	43.5	lb.

No. 36

12% Fat—Sweet Butter, Whole Milk, Skim Milk Powder, 14% Sugar.

Sugar	14	lb.
Gelatin	0.5	lb.
Skim Milk Powder	2.5	lb.
Butter (84%)	11	lb.
Milk (4%)	72	lb.

No. 37

12% Fat—Sweet Butter, Skim Milk, Skim Milk Powder, 14% Sugar.

Sugar	14	lb.
Gelatin	0.5	lb.
Skim Milk Powder	2.5	lb.
Butter (84%)	14.3	lb.
Skim Milk	68.7	lb.

No. 38

12% Fat—Sweet Butter, Skim Milk Powder, Water, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Butter (84%)	14.3 lb.
Skim Milk Powder	9 lb.
Water	62.2 lb.

No. 39

12% Fat—Cream, Milk, Condensed Skim Milk (27%), 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Condensed Milk	16 lb.
Cream (30%)	35.5 lb.
Milk (4%)	34 lb.

No. 40

12% Fat—Cream, Milk, Sweet Condensed Whole Milk, 14% Sugar.

Sugar	8.4 lb.
Gelatin	0.5 lb.
Sweet Condensed Milk	14 lb.
Cream (25%)	38 lb.
Milk (4%)	39.1 lb.

No. 41

12% Fat—Sweet Butter, Skim Milk and Sweet Condensed Skim Milk, 14% Sugar.

Sugar	9.2 lb.
Gelatin	0.5 lb.
Sweet Skim Condensed Milk	12 lb.
Butter (84%)	14.3 lb.
Skim Milk	64 lb.

No. 42

12% Fat—Cream, Milk, Evaporated Milk, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Evaporated Milk (8%)	20 lb.
Cream (30%)	30 lb.
Milk (4%)	35.5 lb.

No. 43

14% Fat—Cream, Whole Milk, Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	2 lb.
Cream (30%)	14 lb.
Milk (4%)	44.5 lb.

No. 44

14% Fat—Cream, Skim Milk, Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	2 lb.
Cream (25%)	56 lb.
Skim Milk	29.5 lb.

No. 45

14% Fat—Sweet Butter, Whole Milk, Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	2 lb.
Butter (84%)	13.3 lb.
Milk (4%)	72.2 lb.

No. 46

14% Fat—Sweet Butter, Skim Milk, Skim Milk Powder, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Skim Milk Powder	2 lb.
Butter (84%)	16.7 lb.
Skim Milk	68.8 lb.

No. 47

14% Fat—Sweet Butter, Skim Milk Powder, Water, 12% Sugar.

Sugar	12 lb.
Gelatin	0.5 lb.
Butter (84%)	16.7 lb.
Skim Milk Powder	8.6 lb.
Water	62.2 lb.

No. 48

14% Fat—Cream, Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	1 lb.
Cream (30%)	41 lb.
Milk (4%)	43.5 lb.

No. 49

14% Fat—Cream, Skim Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	1 lb.
Cream (25%)	56 lb.
Skim Milk	28.5 lb.

No. 50

14% Fat—Sweet Butter, Whole Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	1.1 lb.
Butter (84%)	13.3 lb.
Milk (4%)	71.1 lb.

No. 51

14% Fat—Sweet Butter, Whole Milk, Skim Milk Powder, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Skim Milk Powder	1.2 lb.
Butter (84%)	16.7 lb.
Skim Milk	67.6 lb.

No. 52

14% Fat—Sweet Butter, Skim Milk Powder, Water, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Butter (84%)	16.7 lb.
Skim Milk Powder	7.6 lb.
Water	61.2 lb.

No. 53

14% Fat—Cream, Milk, Condensed Skim Milk (27%), 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Condensed Skim Milk	6 lb.
Cream (30%)	42 lb.
Milk (4%)	37.5 lb.

No. 54

14% Fat—Cream, Milk, Sweet Condensed Whole Milk, 14% Sugar.

Sugar	11.6 lb.
Gelatin	0.5 lb.
Sweet Condensed Milk (8%)	6 lb.
Cream (38%)	40 lb.
Milk (4%)	41.9 lb.

No. 55

14% Fat—Sweet Butter, Skim Milk and Sweet Condensed Skim Milk, 14% Sugar.

Sugar	11.6 lb.
Gelatin	0.5 lb.
Condensed Skim Milk	6 lb.
Butter (84%)	16.7 lb.
Skim Milk	65.2 lb.

No. 56

14% Fat—Cream, Milk, Evaporated Milk, 14% Sugar.

Sugar	14 lb.
Gelatin	0.5 lb.
Evaporated Milk	10 lb.
Cream (30%)	40 lb.
Milk (4%)	35.5 lb.

Fig Cream

For a 10-gal. finished ice cream.

45 lb. unflavored mix No. 10 can of solid packed pie figs ground fine in a food chopper is added while the mix is in the freezer.

Fig and Walnut Ice Cream

For a 10–gal. batch of finished product take 3 lb. canned pie figs, 2 lb. walnuts, run them through the fruit chopper, not too fine, and add the same as for strawberries. Use either English or black walnuts. The English are rather high in price.

The gelatin given in these formulas are .5 of a pound of high grade gelatin, or you may use half good ice cream powder and half gelatin.

When mix is ready pasteurize the whole mix at 145 to 150° F., then viscolize or homogenize the whole mix while hot; cool to 40 or 50° F., age for 24 to 48 hours, then freeze.

Simple Ice Cream Mix

Cream (30%)	35.8 lb.
Milk (3.5%)	49.7 lb.
Sugar	14 lb.
Gelatin	0.5 lb.

100.0 lb. of mix containing 12.5% fat; and 33.4% total solids.

Complex Ice Cream Mix

Cream (30%)	41.7 lb.
Condensed Skim Milk	15.3 lb.
Skim Milk	28.5 lb.
Sugar	14 lb.
Gelatin	0.5 lb.

100.0 lb. of mix containing 12.5% fat; and 37% total solids. Add 9¼ oz. standard vanilla extract to each 100 lb. of mix.

Preparing 20% Cream

To make 360 lb. of 20% cream use 160 lb. of 40% cream and 200 lb. of 4% milk.

Preparing 35% Cream

To make 360 lb. of 35% cream use 310 lb. of 40% cream and 50 lb. of 4% milk.

Chocolate Ice Cream

Milk	32 oz.
Sugar	16 oz.
Flour	2 oz.
Salt	⅛ oz.
Eggs	4 oz.
Cream	32 oz.
Vanillin	¼ oz.
Unsweetened Chocolate	4 oz.

Heat milk and add flour, salt, and sugar. Stir thoroughly in double boiler for 20 minutes after batch is brought to a boil. After the mass thickens, add the beaten eggs and cook for 5 minutes longer with constant stirring. Cool, add cream which has been whipped into a stiff paste, and then add the flavoring. Add the melted chocolate, previously mixed with a litle sugar and warm milk to form a paste. Put in a refrigerator or pack in ice and salt until frozen.

Ice Cream Without Gelatin

Butter Fat	12	lb.
Sugar (Granulated)	12	lb.
Cerelose (Corn Sugar)	4	lb.
Milk Serum Solids	11.75	lb.
Vanilla Flavor	to suit	

Preventing Sandiness in Ice Cream
U. S. Patent 1,940,109

By freezing and whipping air into ice-cream mix at such a rate that 30% of the water is frozen in less than 1 minute a smoother product than usual is obtained and one in which the milk solids may be increased with less likelihood of forming "sandy" ice cream.

Water Ices and Sherbets

The figures are given on the basis of 100 lb. of mix which is about 10½ gal.

Water Ice

Cane Sugar	25	lb.
Corn Sugar	7	lb.
Agar (3.2 oz. or 90.6 g.)	0.2	lb.
Gum Tragacanth or Galagum C (6.4 oz. or 181.2 g.)	0.4	lb.
Water, Fruit, Fruit Acid, Flavor, and Color	67.4	lb.

Overrun 20 to 25%. Total yield 13 gal.

Sherbet Using Milk

Cane Sugar	25	lb.
Corn Sugar	7	lb.
Agar (3.2 oz. or 96.6 g.)	0.2	lb.
Gum Tragacanth or Galagum C (3.2 oz. or 90.6 g.)	0.2	lb.
Whole Milk	50	lb.
Water, Fruit, Fruit Acid, Flavor, and Color	17.6	lb.

Overrun 25 to 30%. Total yield 13.5 gal.

Sherbet Using Cream Mix

Cane Sugar	25	lb.
Corn Sugar	7	lb.
Agar (3.2 oz. or 90.6 g.)	0.2	lb.
Gum Tragacanth or Galagum C (3.2 oz. or 90.6 g.)	0.2	lb.
Ice Cream Mix, without Sugar or Gelatin	10	lb.
Water, Fruit, Fruit Acid, Flavor, and Color	57.6	lb.

Overrun 25 to 30%. Total yield 13.5 gal.

Orange Water Ice
(For 10 Gal. Batch)

Granulated Sugar	21	lb.
Corn Sugar	7	lb.
Galagum C	3	oz.
Orange Juice (or Its Equivalent in Orange Flavor)	1	gal.

Citric acid to suit. Make up to 10 gal with water. Takes no overrun.

Orange Sherbet
(10 Gal. Mix)

Cane Sugar	22½	lb.
Cerelose (Corn Sugar)	7½	lb.
Milk	4	gal.
Gelatin	11	oz.
Orange Concentrate	4	oz.

Citric acid and color to suit. Make up to 10 gal. with water.

Cocoa Junket

Cocoa	2	oz.
Boiling Water	4	oz.
Sugar	4	oz.
Milk	32	oz.
Junket Tablets	2	
Cold Water	1	oz.
Vanilla Extract	¼	oz.

Cook mixture of cocoa and water in double boiler for five minutes. Add sugar, stir until dissolved, and then add milk which has been previously preheated to 100° F. Add vanilla extract and heat to 120° F. Stir in junket tablets which are dissolved first in a little water. Pour into containers immediately, let stand until set.

Reworking Cream

For cream of poor quality mix equal parts of the cream and water and heat to 135° F. in a fore warmer. Condense in a vacuum pan until a volume equal to that of the original cream is obtained. Use 3 parts of cream to 1 part of water for cream that is of a slightly higher grade but that has off-flavors and odors. In this case fore warm and condense also until a volume equal to that of the original cream is obtained.

Composition of Mixes to Be Used in the Manufacture of Sweet Cream Cream Cheese

The most desirable cream cheese that has been manufactured by this method contains from 15 to 18% of dry skim

milk and 20% of butterfat in the final cheese mix.

The following mixes will make a very desirable cream cheese:

Formula No. 1

Per hundred pounds:

Butterfat	20	lb.
Dry Skim Milk	15	lb.
Gelatin (250 Bloom Test)	0.4	lb.
Salt	0.75	lb.

Starter, 3 lb. (if cheese is for immediate consumption or 1 lb. if it is to be held in storage from 7 to 10 days prior to delivery to the consumer).

No. 2

Per hundred pounds:

Butterfat	20	lb.
Dry Skim Milk	18	lb.
Gelatin (250 Bloom Test)	0.4	lb.
Salt	0.75	lb.
Starter	3 or 1	lb.
	(as stated in No. 1)	

No. 3

Per hundred pounds:

Butterfat	25	lb.
Dry Skim Milk	15	lb.
Salt	0.75	lb.
Gelatin (250 Bloom Test)	0.4	lb.

Starter, 3 or 1 lb. as stated in No. 1.

It requires 7 to 10 days for a desirable mild acid flavor to develop in the cream cheese when only 1 lb. of starter is used in the cheese mixes. However, 3 lb. of starter is sufficient to develop the desired acidity by the end of the second day, providing a high quality starter is used in the cheese. If the cheese is to be held in storage for a period of approximately 30 days, 1 lb. of starter or a fraction thereof will develop the desired flavor. All equipment should be thoroughly sterilized prior to use and all ingredients must be of high quality.

The most desirable cream cheese is obtained when using No. 2, however either No. 1 or No. 3 furnishes a very desirable cream cheese.

The addition of dry skim milk, starter, salt and gelatin reduces the butterfat content of the resultant mix and sufficient fat must be added to the mix to replace the decrease in butterfat content by the addition of these ingredients. The addition of 1% of dry skim milk and other non-fat ingredients reduces the butterfat content of the finished cheese mix 0.26 of 1%. Therefore, in preparing a mixture that will furnish a butterfat content of 20% in the finished cheese when using 15% of dry skim milk, the cream from which the cheese is to be made must test 23.9% butterfat.

Cream Cheese (Geneva Method)

(Detailed Directions for 100-lb. Batches)

Acid Flavor

Add 5 lb. of dry skim milk to 93 lb. of sweet cream testing 40 to 42% milk fat. Then add 0.5 lb. of ground agar and 0.75 lb. of salt. The cream should be well agitated as the dry skim milk and agar are slowly added. Pasteurize at 180° to 185° F. for 5 minutes. Cool to 110° F. Add 0.75 lb. of commercial starter. Homogenize at 3500 lb. pressure using no strainer in the intake pipe line. The homogenizer should have been previously run with water at 160° F. or above. Place the cheese immediately into the final package. Chill in a refrigerator at 40° to a temperature of 70° F. and incubate for 12 to 24 hours to develop an acid flavor. Then chill to and hold at 40° F.

The acidity develops slowly and the rate of development is controlled by the percentage inoculation. Reducing the skim milk solids to 3% tends to soften the body of the cheese and increases the tendency towards some whey drainage and lower total acidity. The cheese may be softened by decreasing the homogenization pressure to 3000 lb. or firmed by increasing it to 4000 lb. More than 1 lb. of salt will retard and 1½ lb. almost check acid development. Cream color may be added before pasteurization, if desired, and it has the special advantage of reducing the intensification of color of cheese exposed to the air.

Consideration has also been given to the omission of starter and the securing of the desired acid flavor from Neufchatel, cottage, or Neufchatel cream cheese. The process itself presented no special difficulties (even cottage cheese could be homogenized in the cold or warm cream at 100 lb. pressure) and the mixture was treated in the regular way. About 50% of these acid cheeses is required to impart a very mild acid flavor to the finished product; or a product such as that made from an enriched milk by the cottage cheese process could be homogenized alone. The process is somewhat complicated and the flavor of the finished cheese is very mild, but it has excellent keeping quality.

The homogenizer may be a source of microbial contamination and may chill the first material passing through it. For these reasons the hot water rinse just before use is always essential. The cream mixture was strained through a coarse strainer with approximately 1/16 inch openings and the strainer to the homog-

enizer was always removed from the pipe line to permit an even flow of the cream mixture. Short pipe lines are very desirable to reduce mechanical losses.

The hot cheese may be transferred with a filling machine or by hand to 3- or 5-lb. lined boxes for bulk sale. The usual mayonnaise jar filling machine can be used for filling jars, but some difficulty may be encountered in making the small tin foil or cellophane-wrapped 1- to 4-oz. packages. These packages are made from the cold cheese by molding into proper size with a machine or by cutting into the proper size with a remodeled butter cutter. Some ingenuity must be used in the details of placing the cheese in the package.

Ripened Cheese Flavor (Cheddar and Roquefort)

Add 5 lb. of dry skim milk to 69.25 lb. of sweet cream testing 40 to 42% of fat. Then add 0.75 lb. of common salt. (The agar is not essential in this cheese, but it improves slicing qualities.) The cream should be well agitated as the dry skim milk is slowly added. Remove paraffin, cheesecloth, or other coating from the surface of 25 lb. of well-ripened American cheddar cheese and grind or slice the cheese. Cheese color appears to be desirable for cream cheese of the cheddar flavor to give the cream the usual cheddar cheese color.

For Roquefort flavor use 79.25 lb. of sweet cream, 5 lb. of dry skim milk, 15 lb. of Roquefort cheese and 0.75 lb. of common salt. The entire mixture should be pasteurized at 160° or at 180° F. for 5 minutes, depending upon the keeping quality desired. Homogenize at 3500 lb. pressure, the machine having been previously run with hot water. Place the hot cheese directly into the final package and immediately store at 35° to 40° F. in the refrigerator.

Less Roquefort cheese is generally required as a flavor than is the case for American cheddar. Many persons who object to the flavor of Roquefort cheese consume large helpings of Roquefort cream cheese. Other varieties of cheese may be used, but investigations have been limited to the two varieties mentioned.

The ripened cheeses readily soften and disperse in the cream when the temperature exceeds 145° F. No necessity of using an emulsifying salt was ever encountered, but tests demonstrated that these salts, such as di-sodium phosphate and sodium citrate, could be used in limited amounts without interfering with the process.

Other Food Flavors

Coarsely ground sweet pickle relish (onion flavor is undesirable), pimiento, olive and nut, pineapple, and other food flavors may be used. Add 5 lb. of dry skim milk, 0.5 lb. of ground agar, and 0.75 lb. of salt to 73.5 lb. of cream testing 40 to 42% of fat. The cream should be well agitated as the dry skim milk and agar are added. Pasteurize at 180° to 185° F. for 5 minutes. Homogenize at 3500 lb. pressure, the machine having been previously run with hot water. Stir the flavoring material, 20 lb. is about right for most foods, directly into the hot cheese. Place in the final package and store immediately in the refrigerator at 35° to 40° F.

In some instances there may be an excessive quantity of juice. This can be mixed in the cream just before homogenization, but if the acidity of the juice is high the cream mixture may be previously cooled to 120° to 140° F. before adding the juice and the homogenization pressure reduced to prevent excessive fat clumping and coagulation. If the body is somewhat soft the dry skim milk may be increased to 7 lb.

Most fruit flavors did not blend well with cream cheese, but tart spicy flavors are generally satisfactory.

O. and N. Cream Cheese (Marquardt)

Standardize milk to 10% of fat, then pasteurize at 160° F. for 30 minutes; and homogenize at 2500 lb. pressure and at 120° F.

Cool the batch to 72° F., and add 0.2% of commercial starter and 15 cc. of rennet per 1000 lb. of milk. On the following day drain and salt as in the making of old style cream cheese and analyze for fat.

Mix the cheese prepared in the above manner with 40% cream to obtain the desired cheese fat content. This may be 27, 30, 35 or 40%. Then add 0.1% of gum and 5% of 40% sour cream. Add enough salt to have 0.75% in the finished cheese. Heat this entire mixture to 160° F. and homogenize at 120° F. and 3000 lb. pressure.

Bel Paese Cheese (Farrar)

Use raw milk containing 3 to 4% of fat. Add ½% of lactic culture, and an equal amount of S. thermophilus culture when available. Set the milk at 107° F. with rennet at the rate of 8 oz. per 1000

lb. of milk. The curd is cut after 15 minutes. Then part of the whey is drawn, and the cheese curd is dipped rapidly into the molds.

The cheese should drain on reed mats for 6 hours, being turned frequently. It is desirable to have the room at 80° F. The cheese can be made in brick molds or circular ones 8 inches in diameter. The cheese should be of a thickness when finished so that it will weigh 3 to 5 lb.

The cheeses are salted by submerging in 20% salt brine at 50 to 60° F. for 18 to 24 hours.

The cheeses after drying are placed in a curing room at 40° F. with a relative humidity ranging from 85 to 90° F.

After curing the cheeses are wrapped and packed so as to avoid evaporation. This is exceedingly important. The cheeses cure in 6 to 12 weeks, depending upon the quality of the milk used.

Semi-Soft Cheese (Marquardt)

Use raw or pasteurized milk testing 3.5% in fat. Use 1 oz. cheese color per 1000 lb. of milk. Then add ¼% of commercial lactic culture and ¼% of S. helveticus culture and heat to 87° F. In about 2 hours the acid will increase .02 to .04 in the milk. Then dilute 8 oz. of rennet in cold water and add at this rate for each 1000 lb. of milk.

The milk should set for 30 minutes, and, 30 minutes after cutting it is dipped rapidly into brick or round molds. It is pressed with 10 lb. pressure for 8 hours.

After 24 hours the cheese is rubbed lightly with salt, and then placed in a brine for 24 to 48 hours. The brine is made by dissolving 18 lb. of salt in 82 lb. of water.

The cheese is cured at 53–57° F. for a short time, about 3 weeks. It is then placed in storage at 40° F.

Each cheese should weigh from 3 to 7 lb.

Walter Price Rapid Cottage Cheese Method

Pasteurize skim milk. Cool to 90° F. and add 5% of culture. Acid development of 0.5% will require only 5 hours. Finish making cheese according to standard procedure.

Note: Setting at 72 to 85° F. requires 12 to 18 hours for 0.5% of acid to develop.

Propagating lactic culture:

Select good grade of skim milk. Pasteurize to 180° F. for 1 hour. Cool to 72° F. Add 1% of culture from another culture. Incubate at 72° F. for 12 hours. Place in 40° F. room until ready for use.

Selecting natural culture:

Place 6 qts. of raw skim milk into a 72° F. incubator. After 12 hours select those having a firm curd. Select of the firm curd samples the one having best flavor. Use this as a propagating culture for future batches. Always inoculate from a day old culture.

Developing a commercial culture (Strep. Lact.):

Pasteurize skim milk to 180° F. for 1 hour in quart bottles. Cool to 72° F. and add a few drops of culture from a commercial culture. Incubate for 12 hours. Repeat pasteurization of a fresh batch of skim milk; and inoculate 1% from above culture. Repeat for 3 days, always using the culture just previously developed. After this period the culture is ready for use in cheese, butter, or cultured milk manufacture. Cultures should be transferred daily, and used for 3 weeks or a shorter period.

Developing Special Cultures (Bac. Bulgaricus of Lacto bacillus Acidophilus).

Follow above procedure for commercial cultures.

Incubate at 98° F.

Goats' Milk Cheese

Heat fresh milk to 88° F. Add 25 drops of rennet for each 10 lb. of milk. Before adding rennet dilute it in 20 times its volume of water. Cut in cubes 1 in. square after 45 minutes. Allow to stand for 5 minutes, then dip into molds after stirring gently for 5 additional minutes.

The forms are made of 3X tin; they are 4½ in. in diameter, and 5 in. high. Each form has 5 rows of holes, the holes being 1 in. apart and ⅛ in. in diameter.

The cheese curd is not disturbed until it is sufficiently matted. It is then turned frequently. It remains in the hoops for 30 hours at 70° F. It is then rubbed with salt and placed in a curing room at 60° F. with a high humidity. The cheese should be wiped freely and turned. After 6 weeks they are ready to package. Each cheese weighs ½ lb. and requires 4½ lb. of milk. The cheese is white and has an agreeable flavor at 6 to 10 weeks.

Hokah Sage Cheese

To 69¼ lb. of 40% fat content cream add 5 lb. of dry skim milk. Then add ¾ lb. of common salt and a like amount

of agar agar (ground or powdered). Slice and grind 25 lb. of well cured cheddar cheese into the mixture and stir while heating the batch to 160 to 180° F. Hold at this temperature for 2 minutes and cool to 140° F. Then add 1 to 3 cc. of oil of Sage, Dalmatian. It should be diluted in a pint of water and then mixed into a gallon of the cheese mixture which in turn is mixed into the entire batch. The mixture is then homogenized at 3500 lb. pressure, the machine having been previously run with hot water. If the minimum amount of sage oil is used ½ oz. of sage leaves, *Salvia officinalis*, may be added to the batch after homogenization. In using the leaves great care must be exercised in pulverizing them and removing stems and coarse leaves. Thorough incorporation is an essential. Extensive trials have indicated the desirability of using the oil of sage only.

The cheese should be packaged while hot, and stored at 35 to 40° F.

Cheese Pikante (Marquardt Method)

Roquefort Cheese	20	lb.
Cheddar Cheese	20	lb.
Camembert Cheese	20	lb.
Salt	¼	lb.

Add small quantities of black pepper, cayenne pepper, paprika, and grind through a fine grinder. The addition of 2 to 4% of Sauterne Wine improves the Pikante. Grind with products at 70° F., package and store at 32 to 40° F.

New York Style Sage Cheese

The regular method for making cheddar cheese is followed. At the start 100 lb. of milk for colored curd is used for each 1000 lb. of milk. The small batch of milk is colored green. Both batches are made alike. At cheddaring time the curds of both batches are mixed and matted. Before pressing oil of sage, Dalmatian is atomized over the curd at the rate of ⅛ oz. per 1000 lb. of milk used.

The green color is prepared by soaking green corn, green oats, or alfalfa in water, grinding, and pressing in a cider press. The color must be prepared fresh each day. The amount to add to the small batch of milk depends upon the intensity of color desired.

Some manufacturers prefer to add the oil of sage to the milk before making the cheese.

The above method appears to be the one most commonly used. Other methods have been described but produce less satisfactory results.

Ricotta Cheese (Marquardt)

Heat whey to 190° F. as it is drawn from the cheese vat. Then add sour whey until albumin flakes are like snowflakes. Stop heating when albumin collects on top of whey. Drain in molds or bags. The cheese after draining is surface salted and ready for use.

The sour whey used should have 1% of acid. It may require a Bulgaricus culture to achieve this. To flake out the albumin about 10% of sour whey must be added to the sweet whey. When whey only is used and drained in bags the cheese is called mejette.

Commonly 10% of skim milk is added to the sweet whey to increase the yields.

Hoops used as molds should be 5 inches in diameter and 9 inches high and perforated. If the molds are completely filled with moist cheese with a strainer dipper the cheese resulting will be 7 inches high. The cheese is rubbed with salt and returned to the hoops for 2 hours after the draining period over night without pressure. The cheese should be dried in a room at 110° F. and wrapped in paper and placed in storage.

Maroni Cheese (Marquardt)

This is made by using the Ricotta method substituting whole milk for skim milk and adding 10%. It is molded in hoops 8 inches in diameter and 10 inches high, giving a finished cheese 7 inches high. Ricotta Gras is also the name for the whole milk-whey combination.

Sapsago Cheese

This cheese is made principally in Glarus, Switzerland, from sour, skim milk of cows. It is known also as Schabzieger, Glarnerkase, and Krauterkase. It is claimed to have been made in the thirteenth century; the authentic history at least dates back to the fifteenth century. Sapsago is a small, hard, green cheese flavored with the leaves of a species of clover; it is shaped like a truncated cone, 4 inches high, 3 inches in diameter at the base, and 2 inches at the top. This cheese is imported to some extent into the United States under the name of Sap Sago.

The skim milk from which this cheese is made is not allowed to become sour enough to coagulate on heating, as it would make too hard a curd. The milk, when it has reached the right acidity, is

heated to the boiling temperature while being stirred. Cold buttermilk is then added, as is also some whey having a high percentage of acidity. The material coagulating on the surface is skimmed off. The milk is then stirred, while sufficient acid whey is added to precipitate the casein. When too little whey is used the curd is too soft, and when too much is used it is too hard. The curd is dipped with a skimmer and spread out to cool and then put into boxes and allowed to drain and ferment. The box is kept at a temperature of above 60° F., and pressure is applied by weighting with stones. Ripening is allowed to continue from three to six weeks. If the temperature of the room is too high or if sufficient pressure is not applied, too rapid and strong fermentation results. The curd is used for making the finished product, but the cheese is seldom finished where the curd is made. The curd is ground in a mill, and for every 100 lb. of cheese there is added 5 lb. of salt and 25 lb. of dried Melilotus caerulea, an aromatic clover which is grown in the Canton of Schweiz for the purpose. The ground material is worked up into a dough and is forced into molds lined with linen cloth and the name of the manufacturer is stamped on the large end. The mold is then emptied and refilled. The cheeses are dumped promiscuously into a large cask holding about 200 lb. A comparatively small quantity is shipped into this country. It sells at a low price and is usually grated.

Red Cheese Rind Color

Formula No. 1

Sudan 4 dye is dissolved in equal parts of 70% alcohol and acetone, or

No. 2

Tournesol, Fuchsin, or Bordeux Red dissolved in water (distilled water is preferred), or

No. 3

Iron Oxide, known also as Berlin Red or English Red made into a paste with a heavy oil.

The intensity of the color can be varied by changing the amount of the coloring substance.

Apply to outside of cheese.

Cheese, Ice-Cream and Salad Stabilizer

U. S. Patent 2,007,218

Locust Bean Gum	65 oz.
Irish Moss, Powdered	35 oz.
Karaya Gum	15 oz.

When used in the preparation of cream cheese, the undiluted mixture of the three ingredients mentioned above is added at the time that the curds are mixed with the cream in the usual procedure for the manufacture of cream cheese, and in the proportion of about one-half of 1% by weight on a wet basis. The material is heated to about 165° F., homogenized, and then packed hot.

In ice cream it is used diluted with sugar, in the preferred proportion of one-half of 1% on a wet basis, the stabilizer acts to prevent crystallization of ice particles and thus insures a fine, smooth texture and a body which will hold up under severe shocks, such as are encountered in transportation and handling. The use of it in ice cream also usually results in more rapid freezing, especially in old-style freezers.

Cheese Emulsifiers

U. S. Patent 1,940,031

1–4% of either of following are used:

Sodium Mucate
Sodium Lactate

Preservation of Rindless Cheese

British Patent 434,374

Bacterial action on surface of rindless cheese is prevented by treatment with following prior to heating to 65° C.

Hydrogen Peroxide (35%)	0.3%

Low fat content cheese is heated to 65° C. The peroxide is added, mixed and later heated to 80° C.

Brandy Cheese

Use regular cheddar cheese, preferably an entire small cheese with the surfaces scraped clean, and allow to dry at room temperature for 2 to 4 weeks. Then place cheese in clear water at 40 to 80° F. for several days.

The cheeses are then placed in a mixture of brandy and high grade vinegar for several days. The brandy may be mixed in equal parts or less with the vinegar. Three per cent of salt should be added with a liberal addition of pepper to the brandy-vinegar solution.

Sour Cream

To 20% cream add 2 to 3% skim milk powder. Heat slowly to 120° F. to dissolve the powder and follow this by pasteurizing at 145° F. for 30 minutes. Cool to 70 to 72° F., and add 3 to 5% of

good starter, thoroughly broken up. Dilute 20 drops of commercial rennet extract in about ¼ glass of water and add this to 100 lb. of cream, agitating it thoroughly to distribute the rennet. The rennet helps to form a thick curd and the cream may curdle in a relatively short period. However, you should hold it over night at the ripening temperature of 70 to 72° F. to develop the desired acid flavor. Follow this by breaking up the curd while cooling to 40° F. and hold at this low storage temperature.

Infants' Milk, Synthetic

Sugar	40 g.
Soya Bean Powder	125 g.
Lactose	30 g.
Peanut Oil	20 g.
Dextrin	20 g.
Egg Yolk, Liquid	50 g.
Calcium Lactate	6 g.
Salt	2 g.

Stir in water before use.

Soya Bean Vegetable Milk

If the dried beans, preferably yellow-seeded varieties, are soaked for a few hours, then finely crushed and boiled for about 30 minutes in the proportion of 3 parts of water to 1 part of mash, a milky emulsion is obtained which is very similar in appearance and properties to animal milk. This liquid, separated out by means of a very fine sieve or cloth strainer, is the Soya Bean or vegetable milk used so extensively in China. Soya bean meal after the oil is extracted or whole soya bean meal may be utilized quite as well as the whole bean. In the absence of animal milk, soya bean milk is used extensively in the fresh state and as the basis of various kinds of vegetable cheeses in oriental countries. Soya bean milk in the form of a powder is a commercial product in some European countries, and in parts of the United States it has been used in special feeding cases. The milk can be used successfully in numerous preparations, such as breads and cakes, in creaming vegetables, in milk chocolate, and in custards.

After separating the liquid from the solid material, the residue is still very rich in nutritive substances and can be dried and used for cattle feed or made into flour for human food.

Soya Bean Curd

The addition of magnesium or calcium salts or of rennet or lactic acid to soya bean milk when hot precipitates some of the protein, forming a grayish white curd which settles out, leaving a yellowish water liquid. This curd, after being drained and pressed, represents bean curd of tofu, which is extensively eaten and forms the basis of numerous fermented, smoked, and dried cheeses in China and Japan. Bean curd is made fresh daily and is a staple article of diet among oriental peoples. In many cities of the United States having a large oriental population fresh bean curd may be found in the Chinese and Japanese markets.

Dry Mix for Making Chocolate Milk in Dairies

Cocoa	1.75 lb.
Cane Sugar	7 lb.
Agar, Powdered	0.14 lb.
Vanillin	0.003 lb.
Salt	0.025 lb.

Mix the above ingredients well and add to each gallon of milk in the pasteurizer at 185° F. Agitate and hold for ½ hour.

Cocoa Malt Powder

Cocoa Powder	23 lb.
Fine Granulated Sugar	70 lb.
Malt Powder, Mild Flavor	20 lb.
Skim Milk (Soluble)	14 lb.
Sodium Bicarbonate	2 oz.
Salt	8 oz.
Vanillin	½ oz.
Vanilla Extract	½ oz.

Mix ingredients thoroughly and pass through a coarse sieve. This mixture can be packaged in cans, glass containers, or in 1¼ oz. envelopes for individual use.

Stable Chocolate Milk
U. S. Patent 1,989,758

In carrying out the process of making the milk starch emulsion, the chocolate, sugars (when the latter are used), starch, and the gum may be introduced, as dry substances, into the milk, thoroughly mixed, and the mixture heated to a temperature of 170° to 200° F., or higher if desired—although this is not necessary—in place of temperatures approximating 240° F. heretofore recommended, for periods from 20 to 30 minutes, more or less. Preferably, however, a syrup is first made of the chocolate and sugar, and this syrup, together with a preformed mixture, in proper proportions, of the starch and gum, added to the milk

and the final mixture agitated and heated as described.

As a matter of convenience to the beverage manufacturer, and in order to insure correct proportions between starch and gum, the starch and gum may be compounded together and the compound delivered to the beverage manufacturer.

In making the compound the agar-agar, for example, is preferably ground dry and screened to the same degree of fineness as the starch and is then thoroughly mixed with the starch in the proportions indicated by the specific examples given below. In such a mixture the agar-agar, although very small in quantity, approximately from 1 to 20 parts of agar to 100 parts of starch, will remain evenly distributed in the starch. It will not sift out. This novel mixture will disperse in the chocolate vehicle much more easily than if the ingredients were introduced into the liquid as separate substances. If the agar is not finely ground it will swell instead of dissolving, particularly at the low temperatures preferably used in compounding, with consequent loss of stabilizing power.

The following examples of typical mixtures, with preferred percentages of the ingredients, will serve to illustrate the character of the present invention. The percentages are by weight.

Formula No. 1

Milk	90.48
Cane Sugar	4.82
Dextrose (Cerelose)	2.41
Cocoa (High Grade, Dark)	1.27
Raw Tapioca Starch (Scott Test 150)	1
Agar-Agar	0.02

Any suitable sugars may be used in the suspension or in the dry product or the sugar ingredient may be omitted if desired. The amount of the sugar ingredient may be varied to any extent. For any usable quantity the sugar does not add to the viscosity of the beverage. The amount of cocoa or chocolate may also be varied. The matter of taste or of economy will govern any increase or decrease. As much as 2.5% of cocoa may be used without changing the percentage of starch or gum. The starch ingredient may be increased to 2 or 3%. Experience goes to show that 1% is near the critical lower limit. More than 2 or 3% gives too high a viscosity and is likely to give a distinct starch taste to the product. The agar-agar may be varied in amount from about 0.01% to 0.2%, but at the upper limit there is a strong tendency to segregation in jelly-like lumps.

No. 2

Milk	90.78
Cane Sugar	4.06
Cerelose	2.03
Cocoa (Cheaper Quality than in No. 1)	1.673
Raw Corn Starch (Scott Test 100)	1.433
Gum	0.024

The first four items may be varied as indicated in No. 1.

The same quantity of modified corn starch may be used in place of the specified raw corn starch. The amount of corn starch may vary between 1 and 2%. Where raw corn starch is used the lower limit of the gum quantity should not be quite as low as in No. 1.

No. 3

Milk	91
Cane Sugar	4.07
Cerelose (Corn Sugar)	2.03
Cocoa	1.676
Wheat Starch (Scott Test 85)	1.2
Gum	0.024

The variations may be substantially the same as with No. 1.

The time of cooking with the raw corn starch should be ordinarily 25 to 30 minutes; with the modified corn starch 20 to 25 minutes; with the tapioca and wheat starches about 20 minutes.

Chocolate-Flavored Milk

In this improved formula use:

Cocoa	20 lb.
Sugar	90 lb.
Skim Milk	90 lb.

To the above syrup add 2000 lb. of milk; heat to 143½° F. and hold for 30 minutes. Homogenize the mixture at 2000 to 3000 lb. pressure while hot.

Cool and bottle.

Non-Settling Cocoa Milk

Cocoa Powder	6 oz.
Sugar	28 oz.
Sodium Alginate	1 oz.
Milk	15 qt.

Mix together the cocoa, alginate, and sugar. Heat the milk to 160° F., add the dry mixture slowly with constant stirring, for thirty minutes. Cool the batch to 45° F. and hold for two hours before bottling in sterilized bottles. The cocoa powder can be of any fat percentage from 10 to 25%. The milk can be either whole milk or skim milk, or any

mixture of each. Additional flavoring ingredients such as vanilla, malt, caramel, etc., may be added.

Boiled Cocoa Frosting

Sugar	16	oz.
Salt	1/16	oz.
Water	16	oz.
Vanilla Extract	¼	oz.
Dairy Butter	¾	oz.
Cocoa	3	oz.
Corn Starch	1	oz.

Mix sugar, cocoa, and salt together, then add slowly 8 oz. of boiling water and when all the water has been added bring mix to a boil. Make a pre-mix of corn starch and cold water, then add to the above mix and again bring to a boil. Continue boiling with low flame, until the frosting has become thickened which usually requires 3 or 4 minutes. Remove from flame, add butter and vanilla extract, beat well, allow to set and cool.

Chocolate Filling

Milk	8	oz.
Sugar	2	oz.
Flour	1½	oz.
Salt	1/16	oz.
Whole Eggs	2	oz.
Vanilla Extract	¼	oz.
Unsweetened Chocolate	1	oz.

Heat milk to boiling point, add sugar, flour, and salt, stirring thoroughly. Cook for fifteen minutes, add eggs slightly beaten, cook for 5 minutes longer. Add flavoring and unsweetened chocolate, and 1 oz. powdered sugar and stir.

Chocolate Mocha Frosting

Powdered Sugar	1½	lb.
Hot Coffee	3	oz.
Unsweetened Chocolate	2	oz.
Butter	¾	oz.

Moisten the sugar with coffee, blend the chocolate with dairy butter. Mix the two blends together and beat until smooth.

Chocolate Icing

Unsweetened Chocolate	2	oz.
Water	4	oz.
Sugar	16	oz.
White of Eggs	2	oz.
Vanilla Extract	1/16	oz.

Warm water, then add powdered sugar, cook to approximately 216° F. until the mix threads well on the end of a spoon. Stir in the well-beaten white of eggs, then add melted chocolate and vanilla and stir thoroughly to proper consistency.

Boiled Marshmallow for Topping

Formula No. 1

No. 1

Granulated Sugar	3	lb.
Glucose	12	oz.
Water	1	pt.

Boil to 240° F.

No. 2

Egg Whites	1¼	pt.
Granulated Sugar	8	oz.

No. 3

Water	4	oz.
Powdered Gelatin	1	oz.
Vanilla Extract	½	oz.
XXXX Sugar	4	oz.

Method: Set contents of No. 1 into copper kettle, dissolve well together, and place over moderate fire. Set contents of No. 2 in small 12-quart machine kettle. Warm contents of No. 3 in small bowl and thoroughly dissolve.

When contents of No. 1 reach 225° F., start machine going with No. 2 on high speed. Also see to it that sides of copper kettle are kept clear of sugar crystals, by washing sides of kettle with water and brush.

The meringue content of No. 2 should be ready about the same time that the boiling content of No. 1 reaches the degree of 240° F.

With the meringue ready, and the boiled sugar at 240° F., pour the boiled sugar on to meringue slowly in thin stream (this is important). Let the machine run on high speed during this operation.

Now add dissolved contents of No. 3 to the mass, and continue whipping on high until a fine bodied smooth meringue is obtained.

Formula No. 2
(Quicker Method)

No. 1

Egg Whites	1	pt.
Granulated Sugar	1	lb.
XXXX Sugar	8	oz.
Tapioca Flour	½	oz.

No. 2

Glucose	4	oz.
Water	4	oz.
Gelatin	½	oz.
Vanilla Extract	½	oz.

Method: Dissolve contents of No. 1 all together over double boiler and heat to 120° F. Keep contents stirred with wire hand whip. Now set kettle in machine

and, with wire whip attached, beat on high speed. Immediately dissolve contents of No. 2 by warming, until all are dissolved together, then pour into machine and continue whipping until a fine meringue is obtained.

Whipped Cream for Baker's Topping

The cost of whipping cream and the fact that it will not stand up alone for very long makes its use almost prohibitive.

Fortified Whipped Cream

Cold Water	5	qt.
Meringue Powder	6	oz.
Sugar	4	lb.
Salt	1	oz.
Starch	14	oz.
Gelatin	¾	oz.
Vanilla Extract	1	oz.
Heavy Cream	1	qt.

In the machine put 1 qt. of water, the meringue powder and 3 lb. of sugar and whip to just peak (not stiff). Put 3 qt. of water, the remaining sugar and the salt into a kettle and bring to a boil. Dissolve the starch and gelatin in the remaining water, add to the boiling mass and stir until it is thick and clear. Blend the two mixtures carefully with a wire whip and put in the refrigerator until needed. When ready to use, put the mixture into a clean bowl and smooth down with a wire beater. *Do not beat.* Bring the whipping cream up to about three-fourths stiff, pour it over the boiled mixture, and fold together only until the cream is well incorporated and the mass is smooth.

This should make topping enough for 30 to 40 9-inch pies.

Baker's Pectin Glaze

Pectin	4	oz.
Sugar	8½	lb.
Water or Fruit Juice	2½	qt.
Phosphoric Acid	2½	oz.

Mix the pectin with some of the sugar. Bring the liquid to a boil and add to the sugar-pectin mixture. Take off the fire and stir until the sugar is thoroughly dissolved. When this has been done add the remaining sugar, stirring in the meantime. Allow the liquid to cool, then add acid.

Coat the berries as much as possible and they will not have a chance to "bleed" and thus soak through into the cake itself. If desired the berries may be dipped into the glaze before they are applied to the cake and the remaining pectin poured over them so they are nicely coated.

Baking Powder

Sodium Acid Pyrophosphate	42	oz.
Sodium Acid Carbonate	30	oz.
Maize (or Rice) Starch	28	oz.

Stable Baking Powders

German Patent 599,493

Formula No. 1

Cream of Tartar	44	g.
Tartaric Acid	6	g.
Sodium Bicarbonate	27	g.
Wheat Flour	20	g.
Carbamide	1.5	g.
Magnesium Peroxide	1.5	g.

No. 2

Calcium Biphosphate	34	g.
Sodium Bicarbonate	23	g.
Wheat Starch Powder	40	g.
Carbamide	1.5	g.
Magnesium Peroxide	1.5	g.

No. 3

Sodium Acid Pyrophosphate	44	g.
Sodium Bicarbonate	32	g.
Maize Starch Powder	22	g.
Carbamide	1	g.
Magnesium Peroxide	1	g.

15 g. of above baking powders are used for 500 g. flour.

Soya Bean Flour Bread

Formula No. 1

Soya Flour	65	lb.
Wheat Flour	260	lb.
Sugar	10	lb.
Salt	5	lb.
Yeast	15	lb.
Shortening	15	lb.
Water (Variable)	210	lb.

Mix 3 minutes, ferment at 90° F.

First punch	45	min.
To bench	15	min.
Proof	45	min.
Bake	30	min.
Temperature of Oven	445°	F.

No. 2

Whole Soya Flour	25	lb.
Whole Wheat Flour	25	lb.
Clear	50	lb.
Dry Milk	3	lb.
Salt	1.75	lb.
Shortening	2	lb.
Yeast	2	lb.

Sugar	1.5	lb.
Dry Malt	1.5	lb.
Water	about 10	gal.

The straight dough method is employed. A rather wide range in the quantity of water to be used is permitted. This is done to allow for the particular water absorption of the whole wheat flour and the clear that may be used by the baker. A straight dough is made but the whole soya flour is soaked for half an hour with a portion of the water before the dough is made.

"Non"-Staling Bread
U. S. Patent 2,009,440

One-half to one per cent arabinose (based on flour) is added to dough.

Infant's Cereal
British Patent 416,149

Wheatmeal	52.5	lb.
Oatmeal	18	lb.
Cornmeal	10	lb.
Wheat Germ	15	lb.
Salt	0.5	lb.
Lucerne	1	lb.
Dried Yeast	1	lb.
Bone Meal, Edible	2	lb.

100 lb. of above mixture is cooked with 35 gal. water and then dried on a heated drum.

Storage of Grain and Cereals, Improved
British Patent 429,920

1000 lb. of solid carbon dioxide is used per 214 long tons of grain. Both are fed in simultaneously when loading ships or silos.

Chocolate Fudge

Unsweetened Chocolate	6	oz.
Sugar	2	lb.
Milk	1	lb.
Dairy Butter	1/3	oz.
Vanilla Extract	1/16	oz.

Cook slowly the melted chocolate, sugar, milk, and butter mixture to approximately 235° F. until a soft ball is formed when dropped into water. Remove from fire, add vanilla, beat thoroughly until the mass thickens, and then pour into well-buttered tin.

Chocolate Cream Fudge

Sugar	1½	lb.
Corn Syrup	2	oz.
Unsweetened Chocolate	3	oz.
Salt	1/16	oz.
Evaporated Milk	8	oz.

Heat to a boil, approximately 240° F., the mixed ingredients, until a soft ball is formed when dropped in cold water. Cool to approximately 100° F., and beat to a creamy consistency.

French Candy Balls

Unsweetened Chocolate	16	oz.
Powdered Sugar	2	oz.
Condensed Milk	16	oz.
Chocolate Topping	2	oz.

Melt chocolate in double boiler, add sugar and stir to prevent lumps. Add condensed milk and stir until smooth. Let set in cool place for two hours. Roll mixture into balls of desired size, and then roll balls in plate of chocolate topping. Let stand over night.

Jellied Fruit Candies

Plum Pulp	20	lb.
Peach Pulp	20	lb.
Cane Sugar	22	lb.
Corn Syrup	20	lb.
Powdered Pectin	1	lb.
Water	2	gal.

The pectin is mixed well with 5 lb. of sugar. This mixture is then stirred into the two gal. of water. Cook this solution slowly, to almost the boiling point, with stirring. Then to this smooth solution add the other ingredients. The entire batch is now cooked to 223° F. with stirring. The hot batch may now be deposited in starch molds, and allowed to become cold and firm.

Jellied Orange Candy

Pulp from 50 Oranges.		
Cane Sugar	35	lb.
Corn Syrup	25	lb.
Powdered Pectin	22	oz.
Citric Acid	6	oz.

The pulp is prepared by chopping up the oranges, and then cooked with twice its volume of water until soft, and then rubbed through a coarse strainer, to remove the seeds.

The powdered pectin should be previously mixed with about 10 lb. of sugar. The batch is now cooked to 223° F. Now dissolve the citric acid in a pint of water, add to the batch and once more cook to 223° F. The hot batch is now deposited in starch molds. Allow to become cold and firm.

Jellied Grape Juice Candy

Concord Grape Juice	3 gal.
Cane Sugar	18 lb.
Glucose or Invert Syrup	18 lb.
Powdered Pectin	13 oz.

The pectin is mixed well with about 5 lb. of cane sugar. This mixture is then stirred slowly into the grape juice. The batch is now slowly brought to a boil and then the balance of ingredients are added. Cook to 223° F. with stirring. The hot batch is now run into molds and allowed to cool.

Jellied Apple Juice Candy

Apple Juice (from Cooked Apples)	3 gal.
Cane Sugar	18 lb.
Glucose or Invert Syrup	18 lb.
Powdered Pectin	10 oz.
Citric Acid	5 oz.

Proceed as directed under Jellied Grape Juice Candy.

Jellied Pineapple Juice Candy

This juice can be used in the same manner as outlined for grape juice.

Candied Sliced Orange, Lemon, and Grapefruit Peels

Slice peel about ¼ in. wide and 3 in. long. Cook peel with several changes of water to remove the bitterness and to make the peel tender. Now add to the peel about a 40% solution of sugar syrup (about 3 lb. sugar to the gallon of water) and cook until the temperature on the thermometer registers 217° F. Now drain the peel and allow to dry over night. The peel may be rolled in granulated sugar if desired. The peel can also be colored red or green with certified food color, if desired. Do this when cooking the peel in the last wash water.

Ginger, Preserved

Drain the ginger well and then cut it up. Place in cold water in a steam-pan, gently bringing to the boil and simmering for twenty minutes. Place in sieves to drain. Transfer to a cold syrup of 4 lb. sugar to each gallon of water, and allow to stand until next day. Transfer all to steam-pan, gently bring to the boil and simmer for 15 minutes. Then place in a clean dry tub and allow to stand until next day. Run off the syrup into the steam-pan and add 3 lb. sugar to each gallon of syrup. Stir well and bring to the boil. Return this syrup to the ginger in the tub and allow to stand until the following day, then placing in sieves to dry. Roll in sugar and shake out the loose sugar through a coarse sieve. Lastly, spread out to dry.

Preserving Fruit Peels
U. S. Patent 1,980,013

A process for treating the rind and peel of citrus fruits comprises heating the material in a sugar syrup for a period not to exceed about 1 hour at a temperature from about 212° F. to about 220° F., placing the material in containers with a relatively small quantity of sugar syrup, heating the containers, while they are unsealed, for a period of about half an hour at a temperature from about 212° F. to about 240° F., sealing the containers, and heating them for a period of about half an hour at a temperature of about 212° F. to about 240° F.

Preserving Red Raspberries by Freezing

The best result is obtained by freezing at —18° F. in 50% syrup in either airtight or non-airtight containers, and then storing at —12° F.

Pickling Vinegar Essence

The following is a formula for a concentrated liquid for making pickling vinegar:

Oil of Pimento	½ fl. oz.
Oil of Nutmeg	30 minims
Oil of Clove	90 minims
Tincture of Capsicum	½ fl. oz.
Acetic Acid (B.P.)	20 fl. oz.

One teaspoonful of this essence is mixed with each quart of vinegar to spice it.

Chewing Gum Bases

a. Bubble Gum Base:

Washed Pontianac Gum	425 lb.
Washed Gutta Katian	400 lb.
Washed Gutta Soh	75 lb.
Candelilla Wax	10 lb.

The mixed gums and wax are heated until the total batch contains only 8–9% moisture.

b. Stick Gum Base:

Pontianac Gum	425 lb.
Gutta Katian	400 lb.
Gutta Soh	75 lb.
Candelilla Wax	60 lb.

Chewing Gum

Formula No. 1

Ball Gum:

Base *b* (above)	22	lb.
Corn Syrup	48	lb.
Sugar	117	lb.
Chicle	3	lb.
Wax	1½	lb.
Caramel Paste	2½	lb.
Flavor	2⅔	oz.

No. 2

Penny Stick Gum:

Base *a* (above)	40	lb.
Corn Syrup	40	lb.
Sugar	140	lb.
Flavor	30	oz.

No. 3

Bubble Gum:

Base *a* (above)	35	lb.
Pontianac Gum	5	lb.
Corn Syrup	45	lb.
Sugar	115	lb.
Flavor	28	oz.

Maraschino Type Cherries

Lambert, Royal Anne, Black Republican and Waterhouse varieties can be used. The fresh fruit should show a content of soluble solids in the juice of 16–18% at 21° C. and should be underripe rather than overripe. The bleach solution consists of sulphur dioxide (1.5%) together with sufficient air-slaked lime (5.4 lb. per 100 gal. of bleach) to keep the fruit firm and turgid. The cherries lose 7% in weight during the bleaching process. Approximately 250 lb. of cherries is stored in standard 52 gal. barrels and the strength of the bleach solution checked every few days by titration with standard 0.1 N 1 solution. Following bleaching, the cherries are stemmed, graded and pitted. The sulphur dioxide-lime solution is removed by leaching with hot and then with cold water. The sulphur dioxide remaining in the cherries should be less than 0.035%. The dye used for coloring the cherries is No. 80 Ponceau 3R. A solution of ⅜ oz. of dye powder in 8 gal. of water is sufficient to color 100 lb. of pitted cherries at a temperature of 93° C. After coloring, the cherries are preserved by gradually increasing the concentration of sugar until a 50% syrup is reached. For flavoring, oil of bitter almonds and amyl acetate are used as desired. Pasteurization of the bottled cherries is effected by a heat treatment of 35 minutes at 91° C. for No. 10 cans holding somewhat less than 1 gal.

Preventing Browning of Peaches After Lye Peeling

Dip in ¼% hydrochloric acid for ½ to 1 minute and wash with water.

Non-"Bleeding" Jellies

U. S. Patent 1,913,576

To prevent watering of jellies made with pectin, or agar, use ½ to 1% sodium alginate.

Jam and Jelly from Fruit Juices

Although most fruits contain small quantities of pectin and acid, many fruits do not contain sufficient amounts of these essential elements to produce jellies when the fruit juices are cooked with sugar. A small quantity of malic acid is found in the apple, and a little tartaric acid in the grape. Citric acid is contained in the lemon, the orange, and many other fruits.

Manufacturers of jellies can make high grade pure fruit jelly from all fruit juices by adding a very small amount of fruit acid (either citric, tartaric, or malic), less than one-half of 1%. The addition of small quantities of fruit acid and fruit pectin to fruits which are naturally deficient in these important constituents will improve the fruit flavor in the finished fancy preserve and the standard jam.

There are a few fruits which naturally contain enough acid and pectin to make jellies when the boiling with sugar is continued for 15 or 20 minutes. This excessive boiling, however, evaporates a large quantity of the fruit juice and flavor which should be retained in the finished product. For making jellies from these fruits deficient in pectin and acid, additional quantities of these substances must be added.

Purified powdered pectin is now being made from apples, lemons, and oranges by several firms. The product is very carefully standardized on the basis of jell strength, so that ½ oz. of purified powdered pectin will jell 50 oz. of cane sugar when mixed thoroughly with the sugar and then placed in a suitable cooking pan containing 2¼ pints of water. Heat with constant stirring over a strong flame until the mixture weighs exactly 5 lb., then add ½ of a fluid oz. of a 50% solution of fruit acid. Mix thoroughly and pour into jelly glasses. Purified powdered pectin of such strength is designated "No. 100."

Pectin syrup is made by mixing thoroughly 5 lb. of powdered No. 100 pectin

with 20 lb. of cane sugar. Place the mixture in a suitable container and add sufficient boiling water to make 10 gal. when the temperature of the syrup is reduced to 70° F. Agitate a few minutes to dissolve the pectin. A 50% solution of fruit acid is made by placing 20 lb. of crystal, granular, or powdered tartaric, or citric acid in a 5-gal. stone jar and adding sufficient boiling water to make 5 gal. when the temperature of the liquid is reduced to 70° F. Agitate the hot liquid until the tartaric acid is dissolved.

All fruit juices for jelly production should have as little added water as is consistent with the proper extraction of pectin, color, and flavor from the fruit being used. Soft juice fruits, such as grapes, require very little, if any, additional moisture. Hard fibrous fruits, such as quinces, require the addition of a relatively large amount of water. In the following formulas for jellies, actual fruit juice is specified *exclusive of added water.* If water is added to the fruit during cooking, the amount of juice used in the formula should be increased by an amount equal to the quantity of water added at the time the fruit was heated in preparing it for the press, less the small quantity lost in evaporation.

Loganberry, Guava, or Pomegranate Juice Jelly

Filtered Fruit Juice (About 12 gal.)	100 lb.
Cane Sugar	97 lb.
or	
Fruit Juice from 2x1 Cold Pack Fruit (About 17 gal.)	167 lb.

2x1 cold pack fruit means 2 parts of fruit and 1 part sugar, usually placed in barrels and frozen.

Cane Sugar	30	lb.
Fruit Pectin Syrup	1½	gal.
50% Solution Fruit Acid	10	fl. oz.

Crab-Apple, Currant, Gooseberry, or Quince Juice Jelly

Filtered Fruit Juice (About 12 gal.)	100	lb.
Cane Sugar	97½	lb.
Fruit Pectin Syrup	1¼	gal.
50% Solution Fruit Acid	12	fl. oz.

Cherry, Elderberry, Strawberry, Pineapple, or Raspberry Juice Jelly

Filtered Fruit Juice (About 12 gal.)	100 lb.
Cane Sugar	96 lb.
or	
Fruit Juice from 2x1 Cold Pack Fruit (About 17 gal.)	167 lb.
Sugar	29 lb.
Fruit Pectin Syrup	2 lb.
50% Fruit Acid Solution	20 fl. oz.

Blackberry, Grape, or Plum Juice Jelly

Filtered Fruit Juice (About 12 gal.)	100 lb.
Cane Sugar	97 lb.
or	
Filtered Fruit Juice from 2x1 Cold Pack Fruit (About 17 gal.)	167 lb.
Cane Sugar	30 lb.
50% Fruit Acid Solution	15 fl. oz.

Apricot, Peach, or Nectarine Juice Jelly

Filtered Fruit Juice (About 12 gal.)	100	lb.
Cane Sugar	96	lb.
Fruit Pectin Syrup	2	gal.
50% Fruit Acid Solution	23½	fl. oz.

In each formula for fruit jelly, cook the fruit juice, sugar, and fruit pectin syrup to 220° F. at or near sea level, or 8° above the boiling point of water in your factory. Then add the fruit acid solution and mix thoroughly. Fill the jelly quickly into glass and seal at once. If the temperature falls below 18° F. when the container is closed, it should be pasteurized at 180° F. for 20 minutes, if the glass does not contain more than 8 oz. The yield is approximately 164 lb. of finished jelly at 65% soluble solids.

Standard Cherry Preserves and Jam

Fruit	82	lb.
Cane Sugar	96	lb.
Fruit Pectin Syrup	2	gal.
Fruit Acid Solution (50%)	13½	fl. oz.

In making fancy and standard preserves and jams, cook the fruit, sugar and pectin syrup to 221° F. at or near sea level, or 9° above the boiling point of water at your factory. Then add the fruit acid solution and mix thoroughly. The yield is approximately 158 lb. at 68% soluble solids.

In making standard preserves and jams, cook the fruit, sugar and fruit pectin syrup to 222° F. at or near sea level, or 10° F. above the boiling point of water at your factory. Then add the fruit acid solution and mix thoroughly. The yield is approximately 158 lb. at 68% soluble solids. Fancy preserves, jams, and standard preserves and jams

should pass through a cooling pan to reduce the temperature to 180° F. and then run quickly into glass, and be sealed at once. Then pasteurize glass containing from 1 to 2½ lb. at 190° F. for 25 minutes. The temperature is reduced to 180° F. before running preserves into glass so as to prevent the fruit from floating.

The thermometer should be accurate and should be tested at least once weekly when used daily. A very accurate determination for soluble solids contained in fruit products can be obtained by using a refractometer.

Quince, Damson Plum, Gooseberry or Loganberry Jam

Fruit	100 lb.
Cane Sugar	98½ lb.
or	
Cold Pack Fruit	150 lb.
Cane Sugar	48½ lb.
Fruit Pectin Syrup	3 qt.
Fruit Acid Solution (50%)	7½ fl. oz.

Blackberry, Grape, Strawberry, Raspberry, Pineapple, or Plum Jam (Except Damson Plum)

Fruit	100 lb.
Cane Sugar	98 lb.
or	
Cold Pack Fruit, 2x1	150 lb.
Cane Sugar	48 lb.
Fruit Pectin Syrup	1 gal.
Fruit Acid Solution (50%)	14 fl. oz.

Apricot, Peach, Nectarine or Pear Jam

Fruit	100 lb.
Cane Sugar	97½ lb.
Fruit Pectin Syrup	1¼ gal.
Fruit Acid Solution	18½ fl. oz.

Cherry Preserves and Jam

Fruit	100 lb.
Cane Sugar	96 lb.
Fruit Pectin Syrup	2 gal.
Fruit Acid Solution (50%)	14 fl. oz.

Damson Plum, Gooseberry or Loganberry Jam

Fruit	82 lb.
Cane Sugar	100 lb.
or	
Cold Pack Fruit, 2x1	123 lb.
Cane Sugar	57½ lb.
Fruit Pectin Syrup	3 qt.
Fruit Acid Solution (50%)	7 fl. oz.

Blackberry, Grape, Strawberry, Pineapple, Raspberry or Plum Jam (Except Damson Plum)

Fruit	82 lb.
Cane Sugar	98 lb.
or	
Cold Pack Fruit, 2x1	123 lb.
Cane Sugar	57½ lb.
Fruit Pectin Syrup	1 gal.
Fruit Acid Solution (50%)	13½ fl. oz.

Apricot, Peach, Nectarine or Pear Jam

Fruit	82 lb.
Sugar	97½ lb.
Fruit Pectin Syrup	1¼ lb.
Fruit Acid Solution (50%)	13½ fl. oz.

Cherry Pie Filler

Red Sour Pitted Cherries	450 lb.
Granulated Sugar	135 lb.
Corn Starch	25 lb.
Tapioca Flour	5 lb.
Water	9 gal.
Syrup	7 gal.
Benzoate of Soda	9 oz.

Put the cherries, sugar, syrup and benzoate into a steam kettle with 7 gal. of water. Bring to the boiling point and then add slowly while stirring, the paste made by mixing the corn starch and tapioca flour with the other 2 gal. of water. Heat and stir until the requisite consistency is attained.

Honey Jelly

Strained Honey	24 lb.
Citrus Pectin No. 80	4 oz.
Citric Acid Solution (50%)	1 oz.
Water	1 gal.

Heat the honey to 155° F. in a steam-jacketed kettle.

In another kettle, heat the water to 180° F. Take about a pint of the honey and mix it with the dry pectin to make a smooth paste. Scrape this paste carefully into the hot water and bring to the boiling point, stirring until all is dissolved.

Add this solution to the honey and mix well. The resulting temperature should be 170° F. If not, raise to this point. Stir in the acid at once and run into containers.

For large size containers, 30 lb. pails or larger, use 20% more pectin.

Plum Jam

Fresh Fruit	27	lb.
Water	12½	lb.
Sugar	50	lb.
Pectin	4	oz.
Tartaric Acid	1¼	oz.

Sugarless Marmalade for Diabetics

Lemons 1½, the peel of one large orange, saccharin 5 gr., water 7 oz., gelatin ¼ oz. Wash the orange and lemons, finely shave the skin (avoiding white pith) and chop up small; add the juice and pulp of the lemons. Put into saucepan and cover with the water. Bring to boiling point and simmer for two hours, adding water when necessary to keep to stated amount. Cut the gelatin into fine strips; add it with the saccharin to the mixture and stir for ten minutes. Put it into a jar an leave it to set. The keeping properties of this marmalade are not very good, and if it be desired to store it for any length of time a small quantity of sulphurous acid—forty parts per million—preferably in form of potassium metabisulphite should be added.

Apple Chutney

Apple chutney is prepared from the fresh apples, peeled, cored, and cut into pieces about half an inch cube. The exact shape of the pieces is not important so long as they are not too small. The apples, after chopping, are allowed to stand over night and then drained from any juice that may have separated, the latter being reserved.

To every 60 lb. of apples 100 lb. of sugar is weighed out, made into a syrup with water, and boiled to 240° F. Into this syrup the small quantity of juice that may have separated is incorporated. While still boiling hot the syrup is poured on to the chopped apples in a suitable container, stirred and allowed to stand for 24 hours. The syrup and apple is then placed in a pan and boiled gently, together with chopped raisins, chopped stem ginger, and as much spice (such as mace, pimento, and nutmeg) and vinegar as taste demands, and the product bottled hot. Served with cold meat—particularly ham and pork—and similar dishes, this chutney is delightful. The color should be golden brown, but this can be darkened if desired with a little sugar caramel. The only machinery required, apart from the boiling pan, is a chopping or dicing machine.

Apple Sauce

Apple sauce, well known in every home as the correct adjunct for roast pork and duck, and usually consisting of apples sliced and stewed with a little sugar, can be truly called a sauce if prepared as follows:

Fresh apples, as green and fresh as can be obtained, are placed in a clean barrel. A steam coil is inserted and the apples cooked for 15 minutes by contact with live steam at about 60 lb. pressure. Care should be taken to see that the steam line is drained before the valve is opened, otherwise the condensed water will enter the barrel and materially affect the consistency of the finished product.

When cooked, the apples are passed through a pulping machine, using the finest sieve obtainable.

To 80 lb. of this apple pulp in a boiling pan add 80 lb. of sugar and 5½ lb. of 80% acetic acid. Stir and cook for 15 minutes. Spices (such as cinnamon, cloves, mace, and a trace of onion or garlic) may be added to suit individual taste, and the product filled into wide-mouthed bottles.

Apple Butter

Apple butter, which enjoys considerable popularity, is a preparation of a different type, being intended as a spread for sandwiches and at the tea table, and being in fact a kind of concentrated jam.

Processes vary, but consist in the main in expressing the juice from 100 lb. of freshly cooked apples and concentrating with 70 lb. of sugar in a boiling pan to 234° F. At this point 50 lb. of apple pulp, prepared as in the foregoing formula for apple sauce, are added, together with cinnamon, clove and mace spicing, and the mass gently cooked to 228° F.

Prevention of Browning of Fruit and Juices

Treatment with a 0.1% solution of thiourea prevents or retards browning of surfaces of cut fruits. Addition of 0.01% thiourea to apple juice prevents darkening.

Chevon Mince Meats

Chopped Chevon (Cooked before Chopping)	10	lb.
Brown Sugar	15	lb.
Washed Currants	15	lb.
Molasses	10	lb.
Granulated Sugar	10	lb.

Seedless Raisins	15	lb.
Chopped Apples	30	lb.
Vinegar, Grape Juice, or Sauterne Wine	7	lb.
Strong Coffee (Percolated Preferred)	10	lb.
Jelly (Apple, Currant, Raspberry, or a Mixture)	5	lb.
Citron	5	lb.
Salt	½	lb.
Lemons (Use Juice and Grated Rind Only)	1½	doz.

Cook slowly for 3 hours, adding sufficient water to prevent burning. When cool, add

Rose Water	4 oz.
Cloves	4 oz.
Cinnamon	8 oz.
Nutmeg	4 oz.

Chevon from 8 months to a year old is best for this formula. In using this formula in pies place butter freely over surface before placing top crust.

Salted Soya Beans

A product similar to salted peanuts is obtained as follows:

Soak beans in salted water for 18 hours. Cook beans in lard or vegetable shortening at 170° C. until all water has been driven off and the beans float in the oil.

Fruit Gelatin Powder

Sucrose	30 lb.
Dextrose (Corn Sugar)	30 lb.
Gelatin (175 Bloom)	1.5 –2 lb.
Citric or Tartaric Acid	.75–1 lb.
Fruit Juice, Fruit and Water	37 lb.
Flavor and Color	as desired

The gelatin is mixed in the water and dissolved in the usual manner, the sugars are dissolved and at 145° F. mixed with the gelatin solution. Cool to 100° F. and add remaining liquids such as flavoring, color and acid. Let mixture thicken before adding fruits.

Pour into shallow pans to a depth of ¼ to ½ in. and set in cooler. When set turn out and cut into squares.

About 15% by weight of these cubes are stirred into ice cream as it comes from the freezer. The cubes may be added to the ice cream just before withdrawing but some naturally will be broken up.

A slab of the gelatin can be used as a layer in parfait ice cream and the cubes can be used as fillers in fancy pies, etc.

Jelly "Crystals"

Formula No. 1

Sugar	90 lb.
Gelatin	20 lb.
Tartaric Acid	32 oz.
Flavor	6–8 oz.
Color	as desired

No. 2

Sugar	31 lb.
Powdered Gelatin	5 lb.
Tartaric Acid	4 oz.
Flavor	2 oz.
Color	as desired

Gelatinless Jelly Powder

U. S. Patent 1,974,474

Agar-Agar, Powdered	1/16 oz.
Sugar	1¾ oz.
Tartaric Acid	1/16 oz.
Sodium Bicarbonate	3 gr.

The above forms a stiff jelly with 8 oz. water.

Lemon Gelatin Powder

Sugar	10	lb.
Gelatin	1	lb.
Citric Acid	2.8	oz.
Lemon Oil, U.S.P.	1½	dr.
Certified Yellow Food Color	6	gr.
Water	6½	fl. dr.

Blancmange Powder

Cornflour	100 lb.
Arrowroot	12 lb.
Color	12 dr.
Flavor	6 oz.

Custard Powder

Cornflour (St. Vincent)	300	lb.
Arrowroot	20–30	lb.
Vanilla	6	oz.
Essence Nutmeg	1½	dr.
Color Powder	35	dr.

This to be used at the rate of 1½ oz. per pint of milk. The smoothness of the product is increased by the amount of cornflour used.

Compound Maple Table Syrups

Cane Sugar—Maple Sugar Blends

Sugar Syrup	85 pt.
Vermont Maple Syrup	15 pt.

Corn Syrup—Cane Sugar Blend

Corn Syrup (39° Bé.)	50 pt.
Sugar Syrup	50 pt.

Caramel color to suit.

Cane Sugar—Invert Syrup Blend

Invert Syrup	50	pt.
Sugar Syrup	50	pt.

Caramel color to suit.

Cane Sugar—Molasses Blend

Sugar Syrup	50	pt.
New Orleans Molasses	50	pt.

Sugar Cane Table Syrup

Sugar	7	lb.
Lemon Juice	3	oz.
Cream of Tartar	2	g.
Caramel Color	4	g.
Sugar Cane Syrup	5	oz.
Water	4½	pt.
Benzoate of Soda	¼	oz.

Dissolve the sugar in boiling water, then stir in the lemon juice and cream of tartar and color; then add the syrup and benzoate of soda. Boil for a few minutes and strain through fine muslin.

Chocolate Sauce

Unsweetened Chocolate	2	oz.
Dairy Butter	¾	oz.
Water	4	oz.
Sugar	1	lb.
Vanilla Extract	⅛	oz.

Melt the chocolate, and add the butter, stir until thoroughly mixed. Then add boiling water gradually with constant stirring. Heat to 230° F. and discontinue heating when a small portion cooled on a dish shows the proper consistency. Cool to approximately 100° F., and add the vanilla flavoring, stir thoroughly. This sauce can be used hot or cold.

Apricot Flavor

Linalyl Formate	1½	oz.
Amyl Valerianate	½	oz.
Oenanthic Ether	¾	oz.
Aldehyde C_{14}	⅛	oz.
Benzaldehyde	¼	oz.
Peach Flavor	8	oz.
Glycerin	1	pt.
Alcohol	67	oz.
Water	34	oz.

Banana Flavor

Amyl Acetate	3	oz.
Butyl Butyrate	⅛	oz.
Isobutyl Ketone	¼	oz.
Ethyl Benzoate	⅛	oz.
Orange Oil	¼	oz.
Benzyl Valerianate	⅛	oz.
Cinnamon Oil, Ceylon	15	min.
Mace Oil	30	min.
Heliotropin	¼	oz.
Glycerin	52	oz.
Water	5	pt.
Alcohol	3	pt.

Burnt Almond Flavor

Caramel Color	2	oz.
Glycerin, C.P.	2	oz.
Benzaldehyde	½	oz.
Alcohol	8	oz.
Water	3½	oz.

Cream Soda Flavor

Vanillin	5	oz.
Coumarin	3	oz.
Alcohol or Glycopon S	½	gal.
Glycerin	¼	gal.
Water	¼	gal.

One ounce will flavor five gallons.

Kola Beverage Flavor

Grain Alcohol	5½	gal.
Best Vanilla Extract	14	oz.
Oil of Lemon	14	oz.
Oil of Sweet Orange	7	oz.
Oil of Cassia	21	fl. dr.
Oil of Limes	4	oz.
Oil of Nutmeg	10	fl. dr.
Oil of Neroli	3	fl. dr.
Extract of Coca Leaves	1	fl. dr.

Allow to stand a month or more and then filter.

Maple Flavor

Formula No. 1

Tincture of Foenugreek	6	pt.
Vanillin	¾	oz.
Musk	½	oz.
Balsam Peru	1	oz.
Oil Chamomile	½	dr.
Oil Celery	½	dr.
Tincture of Coffee	2	pt.

No. 2

Foenugreek Oleoresin	5	lb.
Hot Water	3	gal.
Alcohol	1	pt.
Malic Acid	15	oz.
Compound Vanilla Extract	10	oz.
Caramel Color	5	pt.
Simple Syrup	150	oz.

Rye Bread Flavor

Cumin Seed, Ground	11	lb.
Anise Seed, Ground	22	lb.
Coriander Seed, Ground	22	lb.
Caraway Seed, Ground	45	lb.

If a liquid flavor is desired the above is percolated with alcohol or if a non-alcoholic flavor is wanted Glycopon S is used.

"Cloudy" Orange Syrup Concentrate

Gum Arabic	24 oz.
Oil Orange Californian	34 oz.
Oil Lemon Californian	1 oz.
Orange Color Solution	18 oz.
Simple Syrup	72 oz.
Sulphonated Castor Oil	4 oz.
Water	to make 128 oz.

Pass through colloid mill.

Dried Blackberry Concentrate

Dried Blackberries	4 lb.
Alcohol	4 pt.
Water	4 pt.

Cherry Concentrate, Natural

Cherries, Dried	8 lb.
Alcohol	4 pt.
Water	4 pt.

Put cherries in water, heat, cool, and add alcohol.

Cognac Essence

Cognac Ether	650 g.
Rum Ether	650 g.
Sweetened "Saltpeter Spirit"	165 g.
Ethyl Acetate	165 g.
Oenanthic Ether	5 g.
Sugar Color	335 g.
Alcohol (90%)	4000 g.

Rum Essence

Rum Ether	200 g.
Ethyl Acetate	40 g.
Cinnamon, Tincture	10 g.
Catechu, Tincture	10 g.
Vanillin, Tincture	10 g.
Ethyl Formate	75 g.
Angelica Root, Tincture	2 g.
Peruvian Bark, Tincture	15 g.
Orange Flower Water	100 g.
Woodruff Essence	30 g.
Butyric Ether	20 g.
Alcohol (90%)	650 g.
Rum	1000 g.

Rock and Rye Whisky Essence

Grain Fusel Oil Rectified	340 g.
Green Wine Lees Oil	12 g.
Peru Balsam	12 g.
Jamaica Rum Essence	12 g.
Vanillin	6 g.
Ethyl Acetate	12 g.
Coumarin	15 g.
Raisin Wine Essence	580 g.
Peach Essence	8 g.
Bitter Orange Extract	50 g.
Cinnamon Oil	2.5 g.
Clove Oil	2.5 g.

Household Extracts (Alcoholic)

Pure Lemon Extract

Lemon Oil	6.4 oz.
Alcohol, Pure	115 oz.
Water	to 1 gal.

Pure Orange Extract

Orange Oil	6.4 oz.
Alcohol, Pure	115 oz.
Water	to 1 gal.

Pure Almond Extract

Oil Bitter Almond, F.F.P.A.	1.28 oz.
Alcohol, Pure	40 oz.
Water	to 1 gal.

Imitation Vanilla Extract

Vanillin	70 oz.
Coumarin	1/4 oz.
Alcohol, Pure (25% by Volume)	25 gal.
Simple Syrup	80 oz.
Water and Color	to 100 gal.

Imitation Lemon Extract

Citral	3/8 oz.
Alcohol, Pure	5 pt.
Water	to 1 gal.

Caraway Extract

Formula No. 1

Oil of Caraway	3 g.
Alcohol	50 g.
Glycerin	6 g.
Water	41 g.

No. 2

Oil of Caraway	3 g.
Alcohol	80 g.
Water	20 g.

Cardamom Extract

Oil of Cardamom, Ceylon	3 g.
Alcohol	50 g.
Glycerin	6 g.
Water	41 g.

Cassia Extract

Formula No. 1

Oil of Cassia Rectified	3 g.
Alcohol	50 g.
Glycerin	6 g.
Water	41 g.

No. 2 (Cinnamon)
3% Standard

Oil of Cassia Cinnamon	30 g.
Alcohol	200 g.
Water	170 g.

Extract Celery
Formula No. 1

Celery Oil	0.6 g.
Alcohol	600 g.
Water	400 g.

No. 2

Oil of Celery	0.5 g.
Alcohol	60 g.
Glycerin	6 g.
Water	34 g.

Wild Cherry Extract

Wild Cherry Bark	8 lb.
Alcohol	4 lb.
Water	4 lb.

Percolate and filter.

Cinnamon Extract

Oil of Cinnamon, Ceylon	3 g.
Alcohol	50 g.
Glycerin	6 g.
Water	41 g.

Clove Extract
Formula No. 1

Oil of Cloves	3 g.
Alcohol	50 g.
Glycerin	6 g.
Water	41 g.

No. 2

Clove Oil	20 g.
Alcohol	650 g.
Water	350 g.

Coriander Extract
Formula No. 1

Oil of Coriander	3 g.
Alcohol	50 g.
Glycerin	6 g.
Water	41 g.

No. 2

Oil of Coriander	3 g.
Alcohol	80 g.
Water	20 g.

Ginger Ale Extract

Oleoresin Capsicum	112 oz.
Safrol	1 oz.
Cinnamic Aldehyde	1 oz.
Mace Oil	1½ oz.
Citral	1½ oz.
Geranyl Acetate	¼ oz.
Alcohol	1 pt.

One ounce will flavor five gallons.

Extract Juniper

Oil of Juniper	2 g.
Alcohol	90 g.
Water	8 g.

Banana Oil (Synthetic)

	lb.	oz.	dr.	min.
Benzyl Acetate	2	15	7	32
Amyl Acetate	4	4	3	54
Heliotropin	–	1	2	58
Vanillin	–	1	2	58
Butyl Laurate	2	8	3	16
Geranyl Acetate	–	–	2	12
Terpeneless Lemon Oil	–	–	1	16

Blackberry Oil

Vanillin	2 g.
Coumarin	3 g.
Heliotropin	2 g.
Methyl Salicylate	2 g.
Methyl Anthranilate	1 g.
Orris (10% Solution)	5 g.
Coriander Oil	6 g.
Fennel Seed Oil	18 g.
Amyl Butyrate	112 g.
Ethyl Benzoate	256 g.
Amyl Acetate	192 g.
Ethyl Acetate	397 g.
Aldehyde C_{16}	4 g.

Brandy Oil

Green Cognac Oil	20 g.
Oenanthic Ether	80 g.
Rum Ether	80 g.
Fusel Oil	20 g.

Oil Wild Cherry
Formula No. 1

Benzoic Acid	4 g.
Benzaldehyde	6 g.
Amyl Butyrate	6 g.
Ethyl Acetate	24 g.
Ethyl Benzoate	24 g.

No. 2

Amyl Acetate	24 g.
Amyl Butyrate	12 g.
Ethyl Benzoate	12 g.
Benzaldehyde	32 g.
Oil Sweet Orange Calif.	4 g.
Oil Cloves	3 g.

Cherry Oil (Synthetic)

	lb.	oz.	dr.	min.
Benzylidene Formate	1	–	–	—
Oenanthic Ether	4	8	–	—
Ethyl Methyl Anthranilate	1	6	3	12
Benzaldehyde, F.F.C.	3	1	4	48

Oil Cognac

Tincture of Prunes	480 g.
Ethyl Butyrate	21 g.
Oil Cognac	28 g.
Oenanthic Ether	42 g.

Oil of Green Cognac

Sebacic Ether	5 g.
Pelargonic Ether	2 g.
Cognac Oil	3 g.
Oenanthic Ether	90 g.

Cola Oil for Beverages

Oil Lemon	120 g.
Oil Sweet Orange	80 g.
Oil Nutmeg	40 g.
Oil Cinnamon	40 g.
Oil Coriander	20 g.
Oil Neroli, Artificial	40 g.
Alcohol (75%)	15,360 g.

Curacao Oil

Benzaldehyde	15 g.
Oil Cassia	30 g.
Geraniol Extra	30 g.
Linalyl Acetate	50 g.
Petitgrain Oil	75 g.
Orange Oil	650 g.
Lemon Oil	150 g.

"Holland" Gin Oil

Lemon Oil	3 g.
Anise Oil	3 g.
Angelica Root Oil	16 g.
Fusel Oil Rectified	12 g.
Rosemary Oil	16 g.
Coriander Oil	13 g.
Juniper Berry Oil	940 g.

"Old Tom" Gin Oil

Coriander Oil	270 g.
Anise Oil Rectified	80 g.
Juniper Berry Oil Rectified	610 g.
Caraway Oil	20 g.
Angelica Root Oil	15 g.

Oil Grape (Synthetic)

	lb.	oz.	dr.	min.
Oil Cognac Green	–	14	5	26
Methyl Anthranilate	7	2	3	55
Ethyl Cinnamate	–	7	2	43
Propyl Cinnamate	–	5	6	58
Ethyl Butyrate	1	1	4	55

Oil Kümmel Danzig

Carvol	300 g.
Coriander Oil	3 g.
Orange Oil	3 g.

Oil Pear Ethereal

Benzyl Propionate	1 oz.
Amyl Acetate, Pure	11 oz.
Butyric Ether, Absolute	4 oz.

"Scotch" Whisky Oil

Fusel Oil Rectified	510 g.
Cade Oil	84 g.
Ethyl Butyrate	445 g.
Bitter Almond Oil	20 g.
Sweet Almond Oil	20 g.
Guaiacum Oil	10 g.

Oil Strawberry (Synthetic)

	oz.	dr.	min.
Ethyl Acetate	42	5	15
Aldehyde C_{16}	23	3	40
Amyl Acetate	12	6	24
Ethyl Butyrate	9	–	27
Amyl Butyrate	9	–	27
Propyl Iso Butyrate	58	5	15
Ethyl Formate	1	2	13
Oil Cognac, Green	–	6	47
Phenyl Butyl Ketone	2	1	—

Oil Raspberry (Artificial)

	lb.	oz.	dr.	min.
Tea Rose, Oil	–	9	4	45
Aldehyde C_{16}	–	11	5	25
Amyl Cinnamic Formate	1	6	6	10
Vanillin	–	—	3	20
Amyl Acetate	–	10	3	25
Ethyl Butyrate	–	8	2	44
Ethyl Formate	–	8	2	44
Ethyl Acetate	–	12	4	6
Iso Butyl Acetate	2	11	6	20
Iso Cinnamic Acetate	1	7	6	11
Amyl Butyrate	–	8	2	44

Concentrated Foam for Beverages

Saponin	16 oz.
Glycerin	64 oz.
Distilled Water	64 oz.

Use 1 oz. to 15 gal. syrup.

Caffein-Free Coffee
U. S. Patent 2,023,333

Ground raw coffee is extracted with a warm mixture of

αα—dichlorethane and
αβ—dichlorethane

Artificial Mineral Water
Austrian Patent 142,032

1 liter of following solution is mixed with 10 liters of carbonated water:

Salt	0.02 g.
Magnesium Sulphate	0.02 g.

Dihydrogen Sodium Phosphate	0.02 g.
Potassium Nitrate	0.008 g.
Calcium Oxide	0.2 g.

Lime Barley Water

Syrup (66°)	2 gal.
Barley Extract	3 qt.
Refined Lime Juice	1 qt.
Citric Acid Powder	7 oz.
or	
1–2 Solution	14 oz.
Essence Lime	3 oz.
Sulphurous Acid	3 oz.
Lemon Color	½–1 oz.

Orange Barley Water

Syrup (66°)	3 gal.
Orange Concentrate 6–1	1 pt.
Orange Beverage Base	7 pt.
Barley Extract	1 gal.
Orange Color, if Desired	2–6 oz.
Essence Orange	5 oz.
Sulphurous Acid	4 oz.

Tonic Water

Quinine Bisulphate	8 gr.
Aerated Lemonade	4 pt.
Aerated Water	4 pt.

Lemonade Crystals

Sugar	100 lb.
Lemon Juice Powder	4 to 6 oz.
Tartaric Acid	4 lb.

Orangeade Crystals

Sugar	100 lb.
Orange Juice Powder	6 to 8 oz.
Tartaric Acid	4 lb.

Lime Juice Crystals

Sugar	100 lb.
Lime Juice Powder	2 to 4 oz.
Tartaric Acid	4 lb.

SUGAR TABLE FOR SODA WATERS

Pounds of Sugar Added to 1 Gal. Water	Quantity of Syrup Obtained			Sugar Percentage in Syrup	Density	Degrees Baumé at 60° F.
	gal.	pt.	oz.			
1	1	–	10	10¾	1.043	6
2	1	1	4	19¼	1.080	11
3	1	1	14	26½	1.113	15½
4	1	2	8	32¾	1.142	18
5	1	3	2	37½	1.166	20½
6	1	3	12	41¾	1.188	23
7	1	4	6	45¾	1.209	25
8	1	5	—	49	1.227	26¾
9	1	5	10	52	1.244	28¼
10	1	6	4	54½	1.258	29½
11	1	6	14	57	1.271	30¾
12	1	7	8	59	1.284	32
13	2	0	2	51	1.296	33
14	2	0	12	62¾	1.306	33¾
15	2	1	6	64¼	1.315	34½
16	2	2	—	65½	1.324	34¾
17	2	2	10	67¼	1.332	35¼
18	2	3	4	68½	1.340	35⅝
19	2	3	14	69¾	1.347	36

Aging Alcoholic Liquors
U. S. Patent 1,963,165

About a pound and a quarter of potassium permanganate crystals are dissolved in an appropriate amount of water, for example three and one-half gallons. To this solution there is added about a pound of sulphuric acid, preferably concentrated sulphuric acid. The aqueous mixture resulting from mixing sulphuric acid and a water solution of potassium permanganate is added to the raw alcoholic liquor, preferably in the proportions of one pound of liquid to about fifty gallons of raw alcoholic liquor. The raw alcoholic liquor usually

comes in charred barrels provided with a removable bung. In operating according to the present process, the bung is removed from the barrel and the aqueous mixture resulting from mixing sulphuric acid and potassium permanganate in solution is added to the contents of the barrel. Thereafter the bung is replaced and the barrel and its contents are allowed to mature for a short period of time at an elevated temperature. Rye and bourbon are allowed to mature for about three days at a temperature of 120° F., while rum and brandy are allowed to mature for about two days at the same temperature. When using a lower temperature, for example 100° F., rye and bourbon can be allowed to mature for a period of five days, and rum and brandy for a period of four days. The important point is that after the treatment of the raw alcohol liquor with the treating solution there should be a short maturing period. The function of the elevated temperature is to accelerate the maturing period, and therefore, if the temperature is reduced, the maturing period at this point becomes longer and vice versa. If the temperature is increased above 120° F., the maturing period can be shortened. Of course, the upper temperature limit cannot be too high, since the treatment mixture at highly elevated temperatures would deteriorate the quality of the alcoholic liquor.

When the raw alcoholic liquor is treated with the aqueous solution resulting from mixing sulphuric acid and potassium permanganate, there is immediately set up in the liquor a substantial agitation, acting to eliminate the poisonous components of the fusel oils including the aldehydes and the higher alcohols while leaving the esters of the fusel oil to which the aromatic flavor of the liquor is due substantially unimpaired.

After the treated alcoholic liquor has been allowed to mature, as set forth above, the temporary bung is removed. When the bung is removed from the barrel, the chemical and physical action which the liquor is undergoing is very apparent. Immediately upon removal of the bung, there is an evolution of vapors and gases, these representing partial reaction products of the treatment process up to this point. A portion of the impurities present in the original raw liquor have been removed by virtue of the absorptive capacity of the porous lining of the barrel which, as stated, is also in a charred condition, thus augmenting the initial absorptive capacity of the porous wood of which the barrel is made.

Immediately upon removing the temporary bung from the barrel there is added to the treated alcoholic liquor an agent which will function to bleach and stop the chemical and physical activity taking place in the liquor which has been treated with the sulphuric acid and the permanganate mixture. While various agents may be used to effect the bleaching and the cessation of chemical and physical activity in the alcoholic liquor, it has been found that most satisfactory results are obtained by the addition of an oxygen evolving agent. While the preferred oxidizing agent is hydrogen peroxide, other compounds which are the chemical equivalents of hydrogen peroxide may be used.

The amount of the bleaching and activity neutralizing agent which is added to the treated alcoholic liquor will of course vary with the character and quality of the initial raw product and with the amount of the sulphuric acid permanganate solution which has been initially added to the raw liquor. When adding the sulphuric acid permanganate treatment agent in the proportions above set forth to about 50 gal. of raw liquor, it has been found that the addition of eight ounces of 30% hydrogen peroxide gives very satisfactory results.

After the addition of the bleaching and activity neutralizing agent, a permanent bung is inserted into the barrel and the treated alcoholic liquor allowed to further mature, preferably under an elevated temperature. The following maturing procedure has been found to give most satisfactory results. When maturing rum and brandy, the barrels of alcoholic liquor treated in accordance with the previous steps of the process are maintained in a warehouse having a temperature of about 120° F. for about three weeks. Thereafter the temperature is reduced to about 100° for another week, and then to about 80° F. for an additional week. The warehouse or room in which the liquor is being matured under elevated temperature is then allowed to cool off to normal temperature which usually takes about a week or ten days, unless artificial means are used for cooling the temperature of the storage room. In general this period of maturity varies from about 6 to 8 weeks, and the resulting rum and brandy has reached full maturity, having a flavor and mellowness equivalent to rum and brandy which have been naturally aged for a period of approximately four years.

When rye and bourbon are treated, due to the higher content of impurities including fusel oils present in the raw alcoholic liquor, a longer period of maturing is necessary. When rye and bourbon have been treated as above set forth with the sulphuric acid potassium permanganate solution, and then later on after a short period of maturing treated with the bleaching and activity neutralizing agent, the so treated material is subjected for a period of about two months to a temperature of about 100° F. The temperature of the storage room containing the barrels of treated liquor is then reduced to about 100° F. and the treated liquor allowed to mature for about an additional two months. Thereafter the temperature of the storage room is reduced to 80° F. for a period of one month. The storage room is then allowed to cool off to about 70° F., it taking about one month under average conditions for the storage room to reach this temperature, although it is recognized that the cooling may be accomplished much quicker by artificial cooling means.

Kümmel Danzig

Carvol	300 g.
Coriander Oil	3 g.
Orange Oil	3 g.
Alcohol	5000 g.
Water	2250 g.
Glycerin	274 g.

Methyl, Isopropyl and Amyl Alcohols, Tests For

0.1 g. of vanillin is dissolved in 10 mils of alcohol in a test tube and 1 mil of pure sulphuric acid carefully run down the side of the test tube to form a layer at the bottom. By slightly rotating the tube the alcohol and acid are cautiously mixed (care is needed otherwise the sudden rise in temperature will cause violent ebullition) and the colors formed at the area of contact and of the final mixture are noticed.

Methyl Alcohol:	Area of contact	Pale mauve
	Final mixture	Pale mauve
Ethyl Alcohol:	Area of contact	Lemon yellow
	Final mixture	Colorless
Isopropyl Alcohol:	Area of contact	Bright red towards the acid layer changing to deep blue towards the alcohol layer
	Final mixture	Prussian blue
Amyl Alcohol:	Area of contact	Dull red towards the acid layer changing to deep blue towards the alcohol layer
	Final mixture	Prussian blue A white precipitate also forms

In order to differentiate more accurately between isopropyl alcohol and amyl alcohol 10 mils of water are added to each mixture and then shaken well. With isopropyl alcohol the mixture becomes pale blue but rapidly fades, becoming water-white. With amyl alcohol the mixture separates into two layers, the upper alcoholic one being deep grass green (permanent after two hours) and the lower aqueous layer water-white. The white precipitate settles to the bottom.

Approximate Estimation

For the approximate estimation of methyl, isopropyl and amyl alcohols in ethyl alcohol the quantity of sulphuric acid used was increased to 3 mils. Dilutions of the three alcohols in ethyl alcohol were made, 1 in 10, 1 in 100, 1 in 1000 and 1 in 10,000, also a control of ethyl alcohol alone, the color obtained with the latter and the solution of vanillin being a distinct yellowish green.

—	1 in 10	1 in 100	1 in 1000	1 in 10,000
Methyl Alcohol	Blue green	Very faintly blue green	Yellowish green	—
Isopropyl Alcohol	Blue	Pale blue	Blue green	Yellowish green.
Amyl Alcohol	Deep blue	Blue	Pale blue	Very faintly blue green

Preserving Brewer's Yeast

Yeast will keep well indefinitely if covered by a 10% cane sugar solution.

Seed Yeast for Production of Commercial Yeast
U. S. Patent 2,016,791

After mixing about 4 lb. yeast with an aqueous aerated "cream" formed by agitating about 12 oz. of calcium sulphate with water, 0.5 to 1.0% of corn starch is added to the mixture, it is maintained at a temperature of about 28° C. for about 30 hours, then diluted with aerated water and allowed to stand for about 18 hours to produce sporulated and durable yeast.

Isinglass Finings for Beer Clarification
British Patent 432,159

Pieces of isinglass are steeped in acidified water for several hours and then gently stirred continuously for 12–15 hours. The liquid, which then has the consistency of thin treacle, is strained through a fine sieve.

Home Made Wine

To two volumes of water in a large glass bottle, add one volume of washed whole grapes and one volume of sugar. Stopper with a cotton plug, place in a warm place, shake up well daily, and allow to ferment for about 8 weeks or until the evolution of gases ceases. Then siphon off or decant, sweeten to taste, bottle and set aside to age.

Bee Wine

Four ounces of sugar and 4 oz. of treacle are mixed with 1½ pt. of water to form the mother liquid. Small pieces of the ginger beer plant are then added, and the mixture is kept in a warm place. Each day about a teaspoonful of sugar is added, there is brisk fermentation and a palatable drink is soon ready. The ferment quickly increases, and can be used to prepare a new batch.

Orange Wine

Cut well ripened oranges in half and squeeze out juice. Strain out coarse pulp and seeds. Add 150 p. p. m. of sulphur dioxide; corresponds to about 2½ lb. of metabisulphite or about 1¼ lb. of sulphur dioxide per 1000 gal. of juice. Mix well. Add sugar to increase the Balling degree to 22–24° Balling for a dry wine of medium alcoholic content and to 32–33° Balling for one that will contain a small amount of sugar after fermentation is complete.

Ferment large quantities in open redwood vats, artificially cooling the fermenting liquid, if necessary, to maintain the temperature below 85° F. Smaller quantities are fermented in oak puncheons or barrels. Take the Balling degree once a day to follow the course of fermentation.

When fermentation becomes slow and is nearing completion transfer from the open vat to a covered redwood tank, leaving the bung hole open. Fit with a fermentation bung in order to give a slight pressure of carbon dioxide gas in the tank and thus prevent the growth of vinegar bacteria. Similarly equip barrels or puncheons.

When gas is no longer given off remove fermentation bung and fill the tank, puncheon or barrel with fermented orange juice and seal with an ordinary bung. Once or twice a week for several weeks loosen the bung for a few seconds to release accumulated gas pressure until fermentation ceases.

Then let stand for two or three weeks to settle, with bung tightly in place. Next drain off, that is, rack from the sediment; this can be done through a bronze spigot inserted in a bung hole near the bottom of the tank, or by syphoning by hose from smaller container. Transfer to clean cooperage that has been sulphured (in which a sulphur wick has been burned). Fill these containers completely full. Let settle two or three weeks. Then rack. Filter clear. This is easily done, usually by means of a pulp filter. The wine can then be polished brilliantly clear through a porcelain candle, or pad type polishing filter. It should next be aged, in wood as is done with grape wine. If new wood is used the tanks or barrels should be soaked out with dilute soda ash solution and water before use in order that the wine will not acquire too strong a wood taste.

If to be rapidly aged, heat to 120° F. a few days in the presence of about ½% by weight of oak chips if in redwood, and a head space of about 10%. If in oak barrels no chips are needed. Pump over occasionally. Do not overdo the rapid aging process. Watch carefully and stop the treatment when the desired amount of aging is attained. *Try it first on a small scale,* in order to avoid

"grief" and loss by improperly rapid aging of a large quantity.

After aging, the "wine" may need a polishing filtering again. After filtering let it rest in wood a few days to "recover" before bottling.

If a fortified wine is desired a special permit or license is required, numerous regulations must be met and numerous forms filled out, either to install a still and use brandy made on the premises for fortification, or to buy fortifying brandy of high proof. Having conformed to all regulations, etc., then brandy may be added to bring the wine to 20–21% alcohol. "Angelica" type sweet fortified orange "cider" should show about 10% sugar by chemical test and sherry type 2–4% sugar by chemical test. The former is aged like dry wine; the latter is heated at 130–140° F. for 2–3 months to acquire a sherry flavor and color. By gentle aeration the time can be greatly shortened.

"Champagne" type sparkling orange wine can be made by fermenting juice of 21–22° Balling dry; filtering; aging a few months; adding 2% of cane sugar; fermenting in the bottle with Champagne yeast, disgorging and refilling the bottles; or by fermenting in bulk by the Charmat or other bulk process; filtering and bottling under carbon dioxide pressure.

Or the orange "wine," sweet or dry, can be carbonated with carbon dioxide gas in one of several types of carbonating machines.

In order that non-carbonated, nonfortified sweet "wine" after bottling will not undergo bacterial spoilage it may be preserved with about 300 p.p.m. of sulphur dioxide, or by pasteurizing in the bottle at 140° F. for 30 minutes.

Berry "Wines"

Here the procedure is somewhat different than in making orange "wine." Use ripe, sound berries, sorting out moldy fruit. Crush into open vats. Add 8 oz. of potassium metabisulphite or 4 oz. of sulphur dioxide per ton, or about 2½ lb. of the former or 1¼ of the latter to each 1000 gal. The metabisulphite is dissolved in water 8 oz. per gal. before addition. Add to the juice. Mix well. Wait 2 hours. Add a starter or 2–3% pure yeast culture. Stir or punch three times daily until the Balling degree drops to about ⅓ or ¼ the original Balling degree. Fermentation extracts the color and tannin and softens the fruit.

Press in a rack and cloth press. To the juice add for a dry "wine" 15% by weight of sugar; for a sweet "wine" about 25%; that is to 1000 gal. of the juice about 1350 and 2250 lb. of sugar respectively. See that it all dissolves.

Ferment and treat as described for orange "wine."

Rhubarb Wine

Run 32 lb. rhubarb through a meat chopper, strain the juice into a vat and add 6 gal. water. Let stand for 2 days and strain. Let stand for 1 to 2 days, siphon off the clear liquid into a keg and add 24 lb. sugar. Boil up 2 lb. raisins in a little water and add together with 1 lb. sugar coloring. Add also a little gelatin as clearing agent. Let ferment for about 14 days, or until complete. Fill up keg with water and let stand for 4 months before tapping.

Dehydration of Fresh Soya-Slime

German Patent 602,935 and 599,639

Example of a Soya-Mud of composition:

Water	50 oz.
Lecithin	40 oz.
Soya-Oil	10 oz.

Warm

Soya-Slime	100 oz.

to 60° C., and add

Glycerin Containing Dry Sugar (until sp. g. = 1.36 to 1.39)	25–50 oz.

Stir thoroughly ¼ hour, allow to stand. Two layers formed, the heavy one:

Glycerin + Water + Sugar

the light one:

Lecithin + Oil + Water

Repeat to get a water-content of 10%.

Defoamer for the Sugar Industry

Prevents foaming when "saturating" the lime-containing "thin sap."

Woolfat, Neutral.

For the Alcohol Industry:

Coconut Oil	80–85
Vaseline Oil	20–15

Preservation of Coffee
U. S. Patent 1,956,290

Oxidation and "staling" of coffee is curtailed by addition of 0.3% sodium pyrosulphate.

Denaturation for Food Salt
(per 100 kg.)

Formula No. 1

Mineral Oil	0.25 kg.
No. 2	
Iron Oxide	0.25 kg.
No. 3	
Soap Powder	1 kg.
For the Chemical Industry	
No. 4	
Sodium Sulphate, Crystallized	5 kg.
or	
Sodium Sulphate, Calcined	2.5 kg.
No. 5	
Sodium Carbonate	2 kg.
No. 6	
Crystal Ponceau 6R	0.5 g.

Non-Caking Salt
British Patent 407,829

The addition of up to 7% potassium chloride to granular table salt prevents caking.

Non-Caking Sugar

Caking of sugar is prevented by addition of 1% tricalcium phosphate.

Improving Liquid Honey

Heat honey to 71° C.; cool rapidly to 24° C.; add fine crystallized honey with stirring for 15 minutes; cool and bottle.

Non-Mottling and Non-Hardening Maple Sugar
U. S. Patent 1,970,870

Maple sap or syrup is boiled in an open vessel until the temperature reaches 125° F., then allowed to cool, and continuously stirred until cold. The crystallized mass obtained, containing about 2% of water is pressed into blocks occupying 30–31.4 cu. in. per lb.

Clarifying Cider

Pectin (20–30 oz.) is added to 1 gal. of warm cider and the mixture shaken at intervals for 20 minutes. The strained liquor is added to 100 gal. of cider to be clarified, and after 15 hours at approximately 21° C. the cider is siphoned off, mixed with 2–3 lb. of diatomaceous earth, and filtered through canvas.

Wax Coating for Citrus Fruit
U. S. Patent 1,940,530

Fresh fruit (notably citrus) is improved in appearance and made less liable to wither if a thin film of molten wax is rubbed on to the surface (e.g., 5–15% of carnauba wax in paraffin wax at 77–105° C. rubbed on for 10–30 seconds). Advantageous results are obtained if an alkaline wash has preceded this treatment.

Curing Ripe Olives
U. S. Patent 1,928,229

Wash olives in ½ to 2% caustic soda solution then in water till neutral. Soak in ½ to 5% pyrogallol for a few hours. Without rinsing soak in 1% caustic soda solution until skin is penetrated; expose to air until black; wash till free from alkali and then soak in brine to develop flavor.

Storing Walnut Meats

Bleached nuts are preserved by packing in earthenware containers with alternate layers of coconut fiber and a 9 to 1 mixture of salt and sodium dihydrogen phosphate crystals.

Vitamin B Concentrate
Japanese Patent 101,137

Rice bran or other similar vegetable material is extracted with methanol at 60° C. The solvent is distilled off in vacuo. The extractive residue contains a good percentage of vitamin B.

Detecting Cold Storage Eggs

By dipping eggs in lamp black, one can tell immediately whether they are freshly laid or cold storage.

The test depends upon the fact that storage eggs are treated with an oil to preserve them. If it is a cold storage egg, the lamp black will cling readily to the outer shell, while the amount of lamp black adhering to a fresh egg is said to be negligible.

VITAMIN DATA

Vitamins	Functions in the body	Good sources	Effects of various factors on the vitamin
Vitamin **A**	It is essential for: Growth Good health at all ages Successful reproduction Maintenance of healthy membranes which provide a barrier against the invasion of bacteria Its absence causes: The surface covering in various parts of the body to break down. This may allow bacteria to enter, and may result in infection in the eye, in the respiratory tract, and elsewhere	Cod-liver oil, halibut-liver oil, salmon and other fish oils Butter Liver and kidney Egg yolk Whole milk, cream, and cheese made from whole milk Carrots, pimento peppers, spinach and other green leaves, and tomatoes Usually, foods having a yellow or green color. Thus green leaves, yellow corn, and sweet potatoes are better sources than are blanched leaves, white corn, and white potatoes	Long exposure to air, especially at high temperatures, may result in destruction of vitamin A, but it is not readily destroyed by ordinary cooking or canning processes The yellow coloring matter, carotin, which is found in carrots and in other yellow and green vegetables and fruits, may be changed to vitamin A in the body. Carotene is less readily destroyed by exposure to air and to high temperatures than is the vitamin A in animal fats Since vitamin A is "fat soluble" (that is, dissolved in fats and not in water), it is not lost in cooking water, as are some of the "water soluble" vitamins
Vitamin **B** (Anti-neuritic vitamin)	It is essential for: Growth Good health at all ages Normal appetite Proper functioning of the digestive tract Successful reproduction and lactation Its absence causes: The beriberi, or polyneuritis	Whole grains Dried peas and beans Nuts Green leafy vegetables Tomatoes Milk Liver Egg yolk Yeast	Ordinary cooking and canning processes do not destroy vitamin B readily, but since vitamin B is "water-soluble," much of it may be discarded if the cooking water or vegetable juice is thrown away The addition of soda in cooking vegetables increases the destruction of vitamin B Drying apparently does not destroy vitamin B

Vitamin C (Anti-scorbutic vitamin)	It is essential for: Growth Good health at all ages Good teeth and healthy gums The maintenance of blood vessel walls Insufficient amount may cause: Fleeting pains in the joints, sometimes mistaken for rheumatism Its absence causes: Scurvy	Citrus fruits, raw or canned Tomatoes, raw or canned Raw cabbage Raw peppers Spinach While they contain only fair amounts of vitamin C, raw apples, onions, and turnips, and cooked potatoes may be important sources because they are cheap and plentiful.	Vitamin C is the most readily destroyed of the known vitamins. Exposure to air, long cooking, and the addition of soda in cooking tend toward the destruction of vitamin C Drying and storing foods tend to destroy vitamin C. The canning process tends to reduce the vitamin-C content of fruits and vegetables considerably, except in the case of the acid foods such as citrus fruits and tomatoes. When foods are canned commercially, air is excluded, and this process reduces the destruction of vitamin C. Foods canned at home, especially by the open-kettle method, may lose more vitamin C than do commercially canned foods
Vitamin D (Anti-rachitic vitamin)	It is essential for: Growth Good health at all ages Good bones and teeth (by regulating the use of calcium and phosphorus in the body) Its absence causes: Rickets, which in turn may cause permanent deformities of the bones	Cod-liver oil, halibut-liver oil, salmon and other fish oils Egg yolk Ultraviolet rays acting on the skin, either from sunlight or from special lamps (that is, carbon arc, quartz mercury-vapor lamp) Vitamin D is now being introduced into some foods which are not naturally good sources (as milk and bread) by irradiation of the food or of some ingredient *Since vitamin D is not so widely distributed as the other known vitamins, its sources need emphasizing*	Vitamin D may be somewhat more slowly destroyed by exposure to air than is vitamin A Ordinary processes of cooking do not easily destroy vitamin D

VITAMIN DATA—*Continued*

Vitamins	Functions in the body	Good sources	Effects of various factors on the vitamin
Vitamin G	It is essential for: Growth Good health at all ages Prevention of symptoms similar to those of pellagra, such as digestive disturbances and skin lesions Its absence: Appears to be at least one factor in causing pellagra	Fresh lean meat Liver and kidney Milk, fresh, evaporated, and dried Buttermilk Salmon, fresh and canned Eggs Green leaves Tomatoes Yeast Wheat germ	Ordinary cooking temperatures and exposure to air have little effect on vitamin G Use of soda in cooking has a destructive action on vitamin G

Egg Preservative
British Patent 409,623

Eggs are coated with following:

Soft Yellow Paraffin	75 oz.
Tallow	5 oz.
Boric Acid	20 oz.

Destroying Yeast Spores in Soda Water Bottles

Soak for five minutes in 1% caustic soda solution at 45° C. and for 10 minutes in 2% caustic soda solution at 40° C.

Meat Curing Salt
U. S. Patent 1,976,831

Mix together in an aluminum vessel

Sodium Nitrite	1½ lb.
Sodium Nitrate	1 lb.

Melt while stirring. Pour on metal plate to solidify. Pack in air-tight tins.

For treating 100 lb. of beef use ¼ oz. of above ground into 3 lb. of salt.

English Mustard, Prepared
British Patent 412,967

Mustard flour is mixed with cold milk and water with 2% gum arabic and after ½ hour is sterilized by treating at 65–70° C. for 15 minutes, then cooled to 30° C.

Smoked Fish

It is hardly possible to furnish directions for smoking all species of fish, under all the varying weather conditions that will be encountered with the changing seasons. Only the general methods can be given here, as used on a typical variety under average conditions. This is intended as a guide, not an infallible recipe. To smoke fish successfully, experiment and use intelligence—altering the method according to the preference of markets (amount of salt and smoke flavor), the variety of fish, and weather conditions.

There are two general methods of smoking fish—hot smoking or "barbecuing," and cold smoking.

Any fish may be "hot-smoked" or "barbecued" but the following varieties are some of those to be preferred:

Butterfish	Sailfish
Kingfish	Spanish mackerel
Mullet	Shad

Grouper

Sturgeon is always hot smoked.

Because of the keeping qualities of cold-smoked fish, certain varieties offer market possibilities for quantity production, such as:

Alewife or river herring
Shad
Drum
Mullet
Red snapper
Redfish
Grouper
Kingfish
Robalo or Snook
Squeteague (spotted trout)
Spots

In the first method the fish are laid three or four feet above a fire, and cured at temperatures from 150 to 200° F. The fish are wholly or partially cooked by this method, and therefore, no matter how carefully prepared, or how long smoked, will "keep" for periods of from a few days to a couple of weeks. If fish is to be preserved for any period of time, the cold smoking method should be used. In this process the fish are cured over a low smouldering fire at a temperature of 90° F., or less. The efficiency of the process depends on the drying action of the fire, which must be carried on at a temperature that will not cook the flesh. Fish may be given a short cold smoke, if preservation is intended for a few days only, or cured for several days if it is wished to "keep" them for some time. This product is comparable to ham or bacon and should be cooked before using. The same general principles governing smoking, handling, and storing of cured meats should be followed in smoking fish.

A smokehouse for curing small lots of fish may readily be made, following instructions given here. Obtain a box or make one, about 6x3x3 ft. One end, that resting on the ground, should be removed. About 12 in. above this end a false bottom with auger holes at 2-in. intervals is built. This end of the box is set over a pit 2 ft. wide by 18 in. deep.

A trench about 1 ft. wide by 1 ft. deep is dug from this pit for a distance of about 10 ft. The fire pit, a hole 3 ft. wide by 3 ft. long, by 18 in. deep, is dug at the end of this trench, which is then covered by sheets of galvanized iron, forming a chimney for the smoke from the fire pit to the smokehouse. If it is desired to build a more permanent house, terra cotta drain or sewer pipe may be used to connect the fire pot with the smokehouse. Cleats are nailed inside the box on the sides, the first set about 12–14 in. below the top. The trays for holding the fish, or the ends of the smoke sticks rest on these cleats. A few holes should be bored for ventilation in or near the top of the house.

If mullet or Spanish mackerel are to be smoked, the following process is recommended:

The fish should be split along the back just above the backbone, almost to the tail so that it will lay flat in one piece, leaving the belly portion solid. Clear out all traces of intestines, black skin and blood, taking special care to remove the coagulated blood and kidney just under the backbone. The head may or may not be removed, depending on the individual. If the head is cut off, the hard bony plate just below the gills should be allowed to remain, as it will be needed to carry the weight when the fish are hung on rods. If it is cut off the fish often pull loose and drop from the sticks.

After splitting and cleaning, the fish should be dropped in a brine made by adding two cups of salt to 4 gal. of water. They are left in this brine 30 minutes to soak out blood diffused through the flesh. At the end of this time they should be taken out, rinsed, and freed from any remaining traces of blood or other offal. Drain for a few minutes then drop each fish singly in a shallow box of fine salt, "dredging" it about, then picking it up with as much salt as will cling to it, and packing the fish in even layers in a tub or box.

The fish should be left in salt from 1 to 3 hours, depending on weather, size of fish, fatness, and length of time for which preservation is desired. The exact length of time must be determined by the smoker. When the fish are taken out of salt they should be rinsed in brine, scrubbing off all visible particles of salt or dirt. The fish should then be laid on chicken wire drying racks kept out of the direct rays of the sun, but located where a good breeze can reach them. Wire drying racks are desirable as the fish can dry on both sides. One side will remain wet, if laid on boards. The fish should be given about 3 hours drying, until a thin film is formed on the surface, before putting the fish in the smokehouse. If put in immediately after taking out of salt, the fish will be too moist, will require longer smoking, will not color and dry as well and will not have as good a surface.

The fish may be placed in the smokehouse on wire mesh trays, or hung on

sticks or iron rods. In no case should any two fish touch as this will prevent the drying and penetrative action of the smoke. If hung on rods, more fish may be smoked at one time, and they will smoke better, with a clearer color. Trays, of course, give less trouble. Rods are run through the fish just under the hard bony plate at the neck, one rod on each side. Thus, each fish hangs from two rods. Twelve or fourteen fish may be hung on a set of two rods 3 ft. long.

The fire should be started an hour or two before the fish are put in the house. It should be low and smouldering. Almost any hardwood or wood other than pine may be used for fuel. Pine or other pitchy woods will give the fish a bitter taste. Some of the woods that may be used in the Southern States, are scrub oak, live oak, hickory, sweet bay, river mangrove, palmetto roots, button wood, and coconut husks. In smoking any one kind of fish, such as mullet, variety of flavor may be obtained through the choice of wood used in smoking. In addition to the woods listed above, orange wood gives a particularly pleasing flavor. Cypress may also be used. The fire should *not* give off too much smoke during the first 8–12 hours. A dense cloud of smoke should be built up for the balance of the process. The fire *must* be small and steady. Two short chunks of wood—about 2 ft. in length and the thickness of a man's arm are usually sufficient. The fire pit is kept covered with a sheet of metal to drive as much smoke as possible up into the smokehouse, and to keep the fire from burning rapidly. The fire must not be allowed to blaze up. The air should not feel warm on the hand if it is put in the smokehouse. The fish should be smoked for 24 hours, if they are to be kept for a couple of weeks, and for 4 or 5 days if it is wished to keep them for some time. The fire should not be allowed to die out at night or to be built up too large the last thing at night to make it last until morning.

After taking the fish out of the smokehouse dry for an hour or two in the air, then wrap in sheets of waxed paper, sprinkling a little fine table salt on each one, and store in tin or wooden boxes. Keep in a cool, dry place. If signs of mold appear, sponge off with vinegar and give the fish a short smoking for from 3 to 6 hours.

Hot Smoking—German Method

The following method is recommended if it is desired to prepare a hot smoked fish that can be used immediately without cooking. It will keep without molding or souring longer than other hot smoked fish.

Split, clean, and soak the fish to remove blood, as instructed previously. Then prepare a brine as follows: 2 lb. salt, 1 lb. sugar, ½ oz. saltpeter, 1 oz. crushed whole black peppers, 1 oz. crushed cardamom seeds. Make this up into a 90° brine, that is, one that will float a potato with a 10 d. nail stuck in it. Increase the amount of ingredients according to the quantity of brine you wish to make. The number of spices used can be increased in variety and amount. Various spice mixtures are used.

Put the fish in this brine for a period varying from 2 to 4 hours, depending on the size and thickness of the fish, amount of fat, and the taste of the individual. Some require a less salty taste than others. The exact length of time must be determined by experiment. Rinse off the fish in fresh water, and place on drying racks outside in a cool, shady, breezy place to dry for about 3 hours before putting in the smokehouse.

For the first 8 hours that the fish are in the house, give them a cool smoke in a dense cloud of smoke. Then increase the fire until the temperature is between 130 and 150° F. for 2 or 3 hours, or until the fish have a glossy brown surface. This partially cooks or "hot smokes" the fish. Wipe any moisture off the fish, and cool for a couple of hours before storing. Wrap in waxed paper and store in a cool dry place. Do not allow them to come into contact with ice, or store in wet cold.

In some cases the fish are brushed over lightly with vegetable oil (usually cottonseed) either just after finishing the cold smoking part of the process, or on taking out to cool. Another method of handling this fish after smoking is to cut the flesh up into fingers the length of a No. 2 can or pint glass jar. Skin and pack into the can or jar. Then add vegetable oil (cottonseed or olive oil, if you have it) until the spaces between the pieces of fish are filled and there is a layer of oil up to within an eighth of an inch of the top. Seal the cans or jars and store in a cool place such as an ice box until used. Under such conditions it should keep almost indefinitely. As this product is not "sterilized" the cans or jars should be thoroughly scalded before use. In some cases the oil is filled in hot and the containers sealed immediately.

Smoking Fish

Lake Herring and Whitefish

The process of smoking lake herring and whitefish is identical. If the fish are frozen when received at the smokehouse, they are thawed in the open air or better, by immersing and stirring them in a barrel of water of medium temperature. After thawing they are split down the belly to the vent, eviscerated, washed thoroughly, and pickled in butts or barrels, about 4 lb. of fine salt to 100 lb. of fish being scattered among them and sufficient brine of 90° salinity to cover them. Either dry salt or brine alone may be used, the former being preferred in warm weather and the latter during the winter. In case brine alone is used, some dry salt should be placed on top to strengthen the weak pickle floating at the surface. After remaining in the pickle for 10 to 16 hours, according to the strength of the pickle and the flavor desired, the fish are removed and strung on the smoke rods, 10 to 20 fish to each rod, according to its length and the size of the fish.

In stringing, some curers pass the rod through the body immediately below the nape bone, effectively preventing the fish from falling down in smoking, but also marring its apearance somewhat. A more usual way is to pass the stick in at the right gill-opening and out at the mouth. Others pass the rod through the head near or through the eyes, and a few pass it immediately back of the throat cartilage. The latter leaves a neat appearance, yet it permits more fish to fall in the smoking process than when the rod is passed through the head or the shoulders. In some houses the smoke-stick is not passed through the fish, but instead a stiff iron wire, curved in "S" shape, is used to attach the fish to the stick, one end of the wire passing through the fish at the head or beneath the nape bone and the other hung over the smoke-stick. At Grand Haven, and to some extent in Chicago, Milwaukee, and one or two other places, the fish are secured by having stout smoke-sticks, about 1½ in. thick and 2½ in. wide; in the top of each, and about ¼ in. from the edge, is driven a row of tacks or small wire nails at intervals of about 3 in., projecting about ½ in. above the surface. Ordinary cotton wrapping cord is tied to the wire nail at the end of each stick, and by means of this cord passing around each nail a single herring is held in place between each two nails throughout the length of the stick, the fish being placed with the back of the neck against the stick and the cord passing from one nail around the throat of the fish, entering under the gills on each side, and then around the next nail, and so on to the end. By having the stick of sufficient width, a row of small nails may be placed on each edge, so as to attach a row of fish at each side. This removes nearly all risk of the fish falling, and their appearance is not marred by holes through which the smoke-stick has been passed.

Some markets prefer the herring well smoked on the inside and to accomplish this the sides of the abdominal cavity are stretched open by means of small wooden sticks or tooth picks, either one or two sticks to each fish. This permits the smoke to permeate the stomach cavity better and results in a more durable article. In general, the western trade prefers the stomach cavity stretched open, while the eastern markets prefer them without the sticks; but there are exceptions. The smoked lake herring sold in Washington are mostly extended by means of a small stick, or, in case of large fish, by two small sticks.

The fish attached to the sticks are dipped in fresh water to remove surplus or undissolved salt, loose scales, etc., unless they have been rinsed before stringing, drained, and suspended in the smokehouse 4 to 8 ft. above the floor, and subjected to a gentle smoke for 4 or 5 hours. The door or damper is then closed, the fires spread or built up and the fish cooked for 1 or 2 hours according to the amount of fire, the height of the fish, and the particular cure desired. After cooling, which is accomplished either by opening the doors of the smokehouse or by removing the fish to the outside, they are ready for the trade. One hundred pounds of round fish, or 85 lb. dressed, yield about 65 lb. smoked. Ordinarily these fish keep one or two weeks, and even longer.

Lake Trout and Carp

Smoked lake trout and carp are prepared to a small extent in the manner already described for lake herring or whitefish.

Smoked Fish

Alewives, or River Herring

River herring or alewives are smoked in a number of localities, but principally in Maryland and Virginia.

In preparing these fish in the Chesapeake region they are washed in vats and scaled with a knife as soon as prac-

ticable after removal from the water. They are next immersed over night in strong brine, containing 12 to 14 lb. of Liverpool salt to each 100 lb. of fish, with some dry salt on top to strengthen the weak pickle that rises to the surface. The following morning the round fish are strung on smokesticks, the stick being usually entered at the left gill-opening of each fish and out at the mouth, as in case of hard herring or bloaters on the New England coast. The strings of fish attached to the stick are then dipped in fresh water to rinse them off, and after draining and drying for a few hours are suspended in the smokehouse about 6 or 8 feet above the fire, and exposed to a dense but cool smoke made of pine shavings or similar material for about 2 or 3 days. Care must be taken to prevent the fire from becoming too hot, thus causing the fish to crack at the lower end or possibly to fall from the sticks to the floor. Prepared in this manner the river herring will usually keep in good condition in the Chesapeake region for 30 days during the spring and for a somewhat less period in the summer. As the fish are not eviscerated before smoking the decrease in weight is small, 100 lb. of round fish yielding about 85 lb. smoked. The wholesale price is about 20 to 22 cents per dozen, according to the size and condition.

In Washington, Baltimore, and one or two other places the river herring are prepared in the following manner:

The fresh herring are scaled with a knife, gibbed like the pickled herring of Scotland, washed, and pickled for 3 hours in brine, about 20 lb. of Liverpool salt being used for each 100 lb. of fish. On removal from the pickle they are strung on small iron rods, the rod passing through the eye sockets of the fish, drained for an hour or so, and hung in the hogshead smokehouses, in the bottom of which a fire has been made of equal quantities of oak and hickory wood. The fish are dried for a few minutes and then the tops of the hogsheads are covered with old sacks or other suitable material. From time to time the fire is sprinkled with water to produce a vapor and the fish thus exposed to heat, smoke, and steam for about 3 hours, when they are removed and cooled and are then in condition to be eaten. Only oak and hickory should be used as fuel, as other materials do not produce the proper flavor. If the fire becomes too warm it should be smothered with oak or hickory sawdust.

The process of smoking alewives commonly employed in the New England States differs from the Chesapeake process in a few minor particulars. The smokers are usually not so careful about removing the scales with a knife, depending generally on the frequent handling of the fish to scale them if cured soon after removal from the water. It is also customary in salting the fish to permit them to make their own pickle, the fish remaining in the pickle for 3 to 5 days. On removal they are soaked in fresh water for 5 to 6 hours and strung on hardwood sticks, the stick entering through the left gill-opening and out at the mouth. They are next rinsed, drained and dried for a short while and suspended in the smokehouse, where they are exposed to a smoldering fire of hardwood and sawdust for 3 to 4 days, when after cooling, they are ready for sale.

Shad

In the Chesapeake region and at various points along the coast small quantities of shad are smoked, usually in precisely the same manner as already described for river herring, or alewives.

Catfish

Being intended as a substitute, the catfish are smoked in identically the same manner as are sturgeon. The fish as received at the smokehouse are usually beheaded and eviscerated. They are skinned and cut into small pieces, weighing about 1 or 1½ lb. each, and are pickled for 6 or 8 hours in tight barrels. This may be accomplished by rubbing the pieces with salt and placing them in the barrel either with dry salt scattered among them, or simply by placing them in the barrel with dry salt or with strong brine. On removal from the brine the pieces are rinsed by dipping in fresh water, to remove slime, surplus salt, etc.; they are then attached to the smokesticks and drained for an hour or so, and placed in the smokehouse where they are smoked for 7 or 8 hours in the same manner as sturgeon are treated. One hundred pounds of dressed catfish yield from 65 to 70 lb. smoked, and the product sells usually at about 15 or 16 cents per pound. The total annual product of smoked catfish in the United States probably does not exceed 50,000 lb., and its sale is confined principally to those who are willing to accept a substitute because of its being cheaper.

At several points in the Mississippi Valley the small catfish are smoked whole, like lake herring. They are split to the vent and eviscerated, the head and in some instances the skin being left on,

struck with salt in tight barrels, and smoked for a few hours in the manner described for lake herring.

Eels

Generally the eels are received at the smokehouse fresh, directly from the fisheries, but some are also received frozen from cold storage. In the latter case they are thawed by immersing them in water a few hours or by exposure to the open air. Some smokers "slime" the eels with salt; that is, rub the skin with a small quantity of fine salt to remove the slime therefrom. In dressing, the fish are split from the head to the vent and the viscera removed. It is desirable to continue the splitting down to the end of the tail sufficiently deep to remove the large vein along the backbone, but sometimes this may be pulled out without splitting the fish more than an inch or two beyond the vent. Few smokers, however, give attention to this item. The eels are immersed in strong brine from 1¾ to 7½ hours, according to strength of brine, size of fish, and the desired flavor. This brine should be quite strong, about 20 lb. of Liverpool or other good salt being required for each 100 lb. of fish.

In New York the eels are usually pickled for 2 hours, while on the Great Lakes the length of the time is generally about 7 hours. On removal of the fish they are washed, bristle brushes being used by some smokers, while others simply dip the fish in water for removing the slime and surplus salt. A few smokers throw them in a tub of water and beat them with a net for several minutes to accomplish the same purpose. The eels are next strung on iron or steel rods one-third inch in diameter, the rod passing through the head of each eel, or through the throat cartilage and out the mouth, and hung in the open air for a few hours for drying. But if the atmosphere be moist or the saving of time necessary they may at once be placed in the smokehouse.

In New York, where small brick ovens are used, the fish are subjected to a mild smoke for about 4 or 5 hours until they have acquired the proper color, when the fires are gradually increased and they are hot-smoked or cooked for 30 or 40 minutes. At Buffalo and some of the other Great Lakes ports, the smoking is usually at an even temperature throughout and continues for 6 or 8 hours. Mahogany or cedar sawdust is used in New York for making the smoke, while hickory or white-oak wood is used for cooking, the latter being preferred. In Washington the eels are suspended in the hogshead smokehouses over a fire made of oak and hickory wood and dried for 20 minutes, when the hogshead is covered with sacking and thus hot-smoked for 3 or 4 hours, the fires being sprinkled with water from time to time to produce a hot vapor. The smoking must be carefully attended, for if the heat becomes too great the fish will curl up out of shape. A good test to determine whether the cooking is sufficient is the ease with which the skin may be separated or peeled from the flesh when the eel has been split.

The decrease in weight by dressing and smoking is about 35%, 100 lb. of eels yielding 65 to 75 lb. smoked. When eels have been pickled 6 or 8 hours they ordinarily keep 10 or 12 days; but when the salting has been only 2 hours, as is usual at New York, they are liable to mold after 5 or 6 days. Smoked eels keep a shorter length of time than almost any other smoked fish.

Eels are sometimes skinned before being smoked, the process being the same as described above, except that less salting and smoking is required, and it is also very difficult to keep them from falling down off the rods in the smokehouse.

Salting (Including Corning) River Herring

The fish are usually taken from the boats on the day they are caught, but in some cases not until the third or fourth day. All handling of the fish is with scoop nets. When taken from the boats, they are spread upon the wharf for cutting. Sitting on a low inclined seat with his knees on the wharf, the cutter removes the head and belly and scrapes out the roe and viscera, the cut fish being placed in a basket and the roe in a bucket. The fish are then dumped into the washing vats. These are 12 ft. long by 6 ft. wide by 3 ft. deep of 2 in. pine. In some the bottom is inclined about 30° to one side, with a horizontal false bottom of slats above the incline. Scales, dirt and other washings settle down in the deep angle of the bottom and are drawn off with the wash water through two flood gates without loss of time. Others still employ flat bottomed vats with resultant loss of time in cleaning.

The fish are agitated in the vats (which are kept filled with water) for about 10 minutes to thoroughly wash them and then scooped out with dip nets

into slat cars holding about 1200 fish, in which the fish drain as they are transported to the salting vats. The latter are 10 ft. long by 6 ft. wide and 24 to 30 in. deep built of 2 in. Virginia pine. The salting vats contain saturated brine to a depth of 4 in. As each car of fish is dumped into the brine, additional salt is added, the amount depending upon conditions of temperature of fish, etc., with which the skilled packer is fully conversant. When full, the vats contain from 12,000 to 15,000 fish (about 4000 lb.). The fish should be roused once each day while striking. After each rousing, the fish are tamped down lightly and top dressed with a thin layer of salt.

Corning

Early in the season most of the packers in the lower Potomac corn their herring for immediate consumption. This method is usually followed for about 6 to 10 days from April 1. The earliest caught fish are kept in the brine from 12 to 48 hours according to temperature. Fish brined 12 hours when the temperature is from 40 to 50° F. should keep for ten days. After brining, the fish are taken from the vats and spread on the floor, covered with salt and the salt and fish thoroughly mixed, after which they are packed in sugar barrels and immediately shipped to the trade. No fish are corned after the temperature rises above 60° F.

Hard Cure or Tight Pack

Herring intended for storage are kept in the brine for 7 to 10 days according to temperature. At temperatures from 50° to 60° F. 9 to 10 days is sufficient; if from 60° to 70° F., 7 to 9 days will cure them satisfactorily. After the fish are cured, they are taken from the brine and piled on the draining floor to a depth of from 1 to 4 ft. according to available space and allowed to remain there from 4 to 10 days according to the demand for the space. The fish are then weighed or counted (weighing is most accurate) and packed in the barrels, the first layer backs down, the balance backs up with from 2 to 2½ lb. of salt to the layer. A properly packed barrel should contain 160 lb. of fish and 40 lb. of salt.

Salted Fish

Considerable trouble has been experienced in salting fish in warm climates. The methods followed commercially in other regions have not produced a product of good quality, and the directions given generally for salting small quantities, or for the home curing of fish have not always proven satisfactory.

If attempts are made to preserve fish by "pickling" or curing in brine, in a warm climate, the product will either turn "rusty" and sour, spoiling in a short time, or if the quality is good at first the fish soon deteriorates. The best method for curing fish in this region is "dry-salting." That is a combination of salting and drying. If the fish are handled carefully, and directions given below followed closely, a high quality product that will not spoil nearly as rapidly as salted fish now prepared, can be produced. But if instructions are not followed, it is useless to expect much.

In the first place the fish must be absolutely fresh. Do not try to save fish that may be stale, by salting. The fish should be bled, when caught, to drain out all blood possible. Blood decomposes much more easily and quickly than flesh. Fish will keep longer if blood is not diffused through the flesh. They should be thoroughly cleaned as soon as possible. Fish should not be handled roughly in taking out of the net or while in the boat. If fish are piled in heaps, walked on or forked roughly, they will be of inferior quality and spoil much more readily than they would otherwise. Fish should not be left under the direct rays of the sun in an open boat. A tarpaulin should be rigged above the fish.

Mullet and Spanish mackerel are among the best fish for dry-salting, for many reasons, a few of which are: they are split more easily, the loss of weight is less in splitting and cleaning; they are two of the commonest southern fish, and obtained more easily and cheaply. Using this outline as a guide, however, many other varieties of fish, such as grouper, sheepshead, alewives or river herring, spot, croaker, and drum, may be cured successfully, with the resultant product of good quality.

Most fish should be split along the back, just above the backbone, taking care to leave no flesh on it. The fish are split "mackerel style." That is, they must lay flat in a single piece, leaving in the backbone. When the knife is drawn toward the tail it must not go clear through the skin, so that the fish will be in two pieces near the tail. The head may or may not be removed. In splitting Spanish mackerel and other fat fish the backbone is cut out nearly to the tail, where it is broken off. In

cleaning, remove all traces of blood from under the backbone and clear away all the black skin. A wire brush should be used for the blood. "Black skin" is best wiped out by a piece of canvas or gunny sack. If the head is left on, clean out all traces of gills. All cleaning must be done thoroughly and carefully.

When the mullet or mackerel are cleaned they should be rinsed, then dropped in a tub of light salt brine (2 lb. of salt to 5 gal. of water), the fish should be left here to soak 30 minutes. The principal object of brining is to remove traces of blood from the cut flesh. It also "cuts" slime and is better for washing than water. Never use sea water from around a fish house, dock, or near shore. It is invariably contaminated and increases likelihood of spoilage.

Score with a knife under the backbone and then longitudinally through the flesh on the other side. After the fish have soaked 30 minutes take them out, making sure that each one is properly cleaned. Drain them for 15 minutes. If salted at once the excess moisture will require more salt.

Use a "dairy fine" ground mined salt. Ordinary sea salt is more apt to cause reddening. Coarse salt is not as good as a fine salt. Pour the salt into a shallow box about 2 ft. square. Dredge each fish in this salt, rolling it about 2 or 3 times and rubbing salt into the slashes. Pick it up with as much salt as will stick to it. Scatter a thin layer of salt on the bottom of the tub or box used for salting. Then lay in the fish in an even layer, flesh side up. Be sure that no two pieces of fish touch without salt between. Scatter a little salt on top. Continue this until all the fish are in salt. Each layer should be laid in at right angles to the preceding layer. The top layer should be weighted down, to keep the fish under the surface of any brine formed. The top layer should also be packed skin side up. Use about 1 part of salt to 3 of fish.

The salting shed should be light, open, airy, and cool as possible. The mullet will have absorbed enough salt for curing purposes in about 36 hours. Mackerel should be in salt about 48 hours. At the end of this time take the fish out of the salt and scrub them in a brine of the same strength as used in cleaning to remove all excess salt and dirt. No traces of salt should be visible on the surface. After draining 15 to 20 minutes, the fish are ready for the drying racks. These are frames of wood, covered with chicken wire and standing on legs 3 or 4 ft. high.

The drying racks must be placed on dry ground, preferably covered with gravel. Oxidation or rusting sets in immediately if drying is carried on under the direct rays of the sun. But if fish are kept shaded in a breezy location they will dry well with a clear color. For this reason drying is best done in the shade under a roof without walls, so located that as much of a current of air as possible will pass over the fish. The fish are laid out skin side down but are turned 3 or 4 times the first day.

The fish are gathered up and placed under shelter at night to prevent spoilage through dampness. If left spread out in the open at night, they will sour and mold. The time required for drying depends on weather conditions during the drying period, and on the size of the fish being cured. The exact time must be determined by the person curing the fish. For mullet it should average about 4 days; Spanish mackerel, 5 days. The more the fish are dried, the less danger there will be of reddening or rusting. When the surface looks dry and hard, and if the thumb can be pressed into the thick part of the flesh leaving no impression, the flesh can be considered as cured.

In weather where air-drying is impossible, or in climates too humid for this process, the following method may be used. When the fish are "struck through" or have absorbed enough salt for curing purposes, they should be taken out of salt, scrubbed off in brine, then piled in stacks, flesh side down. These stacks should be heavily weighted down in order to press moisture out of the fish. After 10 to 18 hours in the stack the fish should be repacked in dry salt with the top weighted down, and put in storage in a cool dry place.

Store the fish in wooden boxes lined with waxed paper. Scatter a little dry salt between each layer of fish—about 1 lb. of salt to 10 lb. of fish. Store in as cool and dry a place as possible. If signs of rust or mold appear, scrub the fish off in brine and dry in the air for a day or two.

Reddening of salted fish is a form of bacterial spoilage caused by the salt used in curing. Contrary to popular belief, salt is not strictly an antiseptic, and certain types of bacteria live and thrive in a salt medium. Salt most apt to be contaminated is that obtained by evaporation of sea water. Several types of salt used extensively in fish curing are apt to be thus contaminated. In salting fish

every effort should be made to use a salt as pure and high in grade as possible. It is advisable to heat salt and bake it thoroughly before using. If, however, reddening appears at any time, all tables and other equipment used in salting should be thoroughly disinfected. Unless every effort is made to keep the salting equipment clean, the use of sterilized salt or other precautions will be useless as the fish can be contaminated through unclean equipment. After curing, the fish should be stored in the coolest place possible, as the salt reddening bacteria grows best at a warm temperature. At first signs of reddening the fish should be removed, washed thoroughly in pure salt brine, and given a few hours careful drying and repacked with a thin layer of dry salt between each layer of fish, using from 10 to 15 lb. of salt to 100 lb. of fish. Reddening is most apt to appear in fish stored in pickle (brine) and held in a warm place. It will remain in good condition longer if packed in dry salt and held in as cool a store room as possible.

Canning Alewives or River Herring; Roe and Buckroe

The following method of canning alewives has proved quite satisfactory. The fish are cut, washed, and placed in the salting vats in the same manner as if intended for salt curing. After 12 to 14 hours they are removed from the vats and washed in an abundance of lukewarm fresh water. During the washing they are trimmed, the balance of the fins and scales being removed. They are then cut to can size and placed in the cans, after which they are processed for 55 minutes at 244° F. for No. 1 cans and 60 minutes for No. 2 cans.

Herring roe intended for canning is collected in buckets as the fish are cut and washed in fresh water in special trays, blood and adhering particles of entrails being removed. The roe is then put in the cans. As it swells considerably in processing, the cans must not be entirely filled. If of the sanitary type, the cans are filled to within about three-fourths of an inch of the top with roe and then filled to the edge with cold salt brine, about 1 lb. of salt to 8 or 10 gal. of water being used to make the brine. The brine is added solely for seasoning. The cans are immediately capped and placed in the processing baskets. If solder-top cans are used, the filled cans are placed in the exhaust box. Upon removal from the exhaust, the necessary air space is provided for by pressing the roe down with a plunger. Material clinging to the groove where the solder is to be applied is removed with a brush and the cans are capped and tipped. The canned roe is processed in a closed kettle for 45 to 55 minutes at a temperature of 240°-245° F. The milt roe may be canned in the same manner as the roe except that the cans can be more completely filled, as this product does not swell in the processing. As the quantity of brine used in this case will be somewhat less, it should be made correspondingly stronger.

Note: In canning the fish, they should be drained of superfluous water before they are placed in the cans, and no water added to can contents. That the fish may retain their shape in the can and stand transportation, the cans should be well filled. The shrinkage of the fish in processing must be taken account of in filling the cans.

Canning Clams (Alaska)

The first operation is the removal of the clams from the shells. This is done by immersing them in boiling water, either in vats especially designed to receive the wire baskets in which the clams are placed or the clams are passed through the water on an endless belt. After remaining in the water several minutes they are thrown on a table and the shells fall away from the meat. The clams are then passed on to women workers, who open the stomachs and necks, remove the sand and sediment therefrom and sever the black part of the neck. The cleansing process is continued by placing the meat in a cylindrical perforated washing machine, which revolves automatically half a turn both ways in a tank filled with water. Any sediment that may have remained after the hand operations were completed is thus removed. The clams are now ready to be canned and are taken directly to the filling tables if whole clams are packed, or to the grinder if the minced variety is desired. The cans are filled by hand with both meat and juice, after which they pass through the topping and sealing machines and are sealed. The process is completed by cooking the canned product in retorts at a temperature of about 245° F. from 1 to 1½ hours, depending upon the size of the container used. The juice which is thrown off in the process is used in preparing the finished product, the surplus being sealed in cans.

Anchovy Paste

Anchovy paste from sprats may be made as follows: Sufficient for a peck of sprats—2 lb. common salt, 3 oz. bay salt, 1 lb. saltpeter, 2 oz. prunella, and a few grains of cochineal, pounded well together in a mortar; into a stone jar place first a layer of fish, then of the pounded ingredients, and so on until the jar is filled; press them hard down and cover closely. After 6 months they will be ready for use.

Note: Persons using such preservatives as saltpeter should consult the Bureau of Chemistry, Washington, D. C., to determine whether they are using an amount in excess of that held to be proper under existing law.

Anchovy Butter

Take 1 part of anchovies which have been beaten to a paste, and pass through a sieve; add 2 parts of butter, and spice to suit. Cayenne pepper or paprika may be used to advantage.

Anchovy Essence

Anchovy essence can be made with either canned or bottled anchovies. Take the fish, and rub to a pulp in a mortar, and then pass through a fine sieve. To ¼ lb. of anchovies add ¼ lb. of water; boil for 15 minutes, and strain; then add ½ oz. of salt and ½ oz. of flour, and the pulped anchovies. The mixture is allowed to simmer over the fire for 3 or 4 minutes. After the preparation is cool add 2 oz. of strong vinegar. The product should be bottled in small bottles and tightly corked and covered with bottle wax.

Anchovy Paste

Prepared by taking 1 lb. of anchovies, 1 lb. of water, and 2¼ oz. of salt and 2¼ oz. of flour; add a small quantity of cayenne pepper (say 1/10 oz.), a small quantity of grated lemon peel, and ½ oz. of mushroom catsup.

Anchovy Sauce

Take 3 or 4 anchovies, and chop them fine; add 3 oz. of butter, 2 oz. of water, 1 oz. of vinegar and 1 oz. of flour. Melt the butter over a water bath, add the water and the vinegar, and lastly the flour and the anchovies; stir until the mixture is thick, then rub through a wire sieve. This preparation should be kept on ice, and will not keep indefinitely.

Mushroom Catsup

Upon a suitable quantity of the fresh mushrooms sprinkle salt (about 1 to 4 of the fungi), and after 3 days squeeze out the juice. To every gallon of juice add black pepper, ginger and cloves, of each ½ oz.; pimento, 2 oz.; mustard seed, 2 oz.; and a sufficient quantity of salt. Boil for 5 minutes and set aside to settle. Strain after 7 days.

Christiana Anchovies

In the preparation of Christiana anchovies many methods and flavoring ingredients are used, depending on the skill and ideas of the curer and the markets for which the preparation is intended. The following is one of the most popular processes:

The fresh sprat or anchovies are immersed in brine for 12 or 18 hours, 15 lb. of Liverpool salt being used for each 100 lb. of fish. On removal, the fish are drained in a sieve and then loosely packed in a barrel, with the following ingredients, which have previously been finely crushed and well mixed: 4 lb. of Luneburg salt, 6 units of pepper, 6 units of sugar, 6 units of English spices, 1 unit of cloves, 1 unit of nutmeg, and 1 unit of Spanish pepper. The anchovies remain saturated with these ingredients for 2 weeks, when they are repacked tightly in kegs or barrels, being carefully arranged in layers, with the backs downward. A quantity of the ingredients above mentioned is sprinkled over each layer, with the addition of a few cut bay leaves or cherry leaves. At the bottom and the top of the package is placed two whole bay leaves, but before the top leaves are laid on, brine is poured over the fish. The barrels or kegs are then coopered and rotated daily for the first few days, and after that every other day for 2 or 3 weeks.

The following process is also used to some extent.

The fish are salted for 24 hours and next immersed in sweetened water, 20 parts of water to 1 part of sugar being used. The fish are then packed with a mixture of Luneburg salt with 90 units or parts of allspice, 60 units of pulverized sugar, 19 units of whole peppers, 15 units of cloves, an equal quantity of nutmeg or mace and of hops (Origanum creticum), and some bay leaves.

The following is a choice method of preparing "*Matjeshering*" in Germany:

Fresh full herring, both spawners and milters, are well washed, and the gills,

stomach, and intestines are removed in such a way as not to necessitate cutting the throat or abdomen, this being accomplished by pulling them through the gill flap. The fish are next immersed for 12 or 18 hours in a 7% solution of white-wine vinegar, from which they must be removed before the skin becomes flabby and be wiped dry and covered with a preparation composed of 2 lb. of salt, 1 lb. of powdered sugar, this quantity being sufficient for 75 herring. The fish are then packed in a barrel which is sealed. When there is not sufficient brine to fill the barrel, additional should be made of 1 part of the above mixture and 4 parts of water which has been boiled.

Spiced herring (Gewurzhering) are prepared in Germany in the manner above described, with the addition of spices mixed with the salt. The spices commonly used consist of 1 part of Spanish pepper, 5 parts of white pepper, 4 parts of cloves, 2½ parts of ginger, an equal quantity of mustard, and a particle of mace and of Spanish marjoram, with a few bay leaves scattered between the layers.

Smoked Pork Sausage

Formula.—Meats: 100 lb. strictly fresh pork trimmings, 85% lean and 15% fat.

Seasoning:

Salt	2½	lb.
Ground White Pepper	10	oz.
Granulated Sugar	4	oz.
Ground Nutmeg	1	oz.
Ground Ginger	½	oz.
Nitrate of Soda	2	oz.

Nutmeg and ginger may be omitted and sage substituted. Some classes of trade prefer this product with only salt, pepper, sugar and nitrate of soda in the seasoning formula.

Processing.—Inspect pork trimmings to see that they are fresh and lean. It may be necessary to re-trim, removing blood clots, gristle and hair. Proportion of fat and lean should be closely watched since fat has a tendency to render out in the smokehouse and soften the product. Grind pork through 5/32 or ¼-in. plate of the hasher, first making sure knives and plates are sharp. Some packers use a rocker entirely for pork sausage.

Place meat in mixer and add seasonings. Mix seasonings and meat for about 5 minutes or until ingredients are thoroughly intermingled. At the time seasoning is added a small quantity of crushed ice (not more than 7 or 8 lb. per 100 lb. of meat) may be used.

Stuffing.—After seasonings, meat and ice are thoroughly mixed, the product goes to the stuffing bench where it is stuffed in medium hog casings. Link in double links, 3½ in. in length, knotting ends of casing to prevent meat dropping on truck or floor. Trim off all scrap ends of casings on the outside of knot, but be sure scraps do not get mixed in with the meat.

Carefully puncture casings to prevent air pockets between casings and meat. Sausage must be hung on a truck as fast as it is linked. When truck is filled, put it under an overhead cold water spray for several minutes to thoroughly remove grease and sediment from outside of casings.

Scrap meat on the bench should be handled promptly and mixed with meat stock in the truck. It should not remain on bench for any length of time as it deteriorates rapidly.

Cooling.—After stuffed sausage has been sprayed it is taken to cooler and spread on trucks or in hanging sections and allowed to hang overnight at a temperature of 36 to 40° F. Product is removed from cooler the next morning and allowed to remain in natural temperatures for about 2 hours.

Smoking.—Then it is placed in the smokehouse at a temperature of 115 to 120° F. and carried at this temperature for about 3 or 4 hours. It does not require a heavy smoked color.

After smoking it is placed in the cooler at a temperature of 45 to 50° and allowed to hang for 2 to 3 hours until thoroughly cooled. Then it is packed in cartons if it is to be shipped promptly. This product should be manufactured only as needed.

Pork Sausage

Meats:

Cali Butts	45	lb.
Selected Ham Fat	55	lb.

Seasoning:

Salt	1¾	lb.
Fine White Pepper	7	oz.
Fine Sage	2¾	oz.
Cardamom	⅓	oz.
Savory	⅜	oz.
Marjoram	⅓	oz.
Ginger	1	oz.
Sugar	3	oz.

Put ham fat on rocker with 3% ice for 8 minutes, then add seasoning and lean meat and rock for 10 minutes more,

making 18 minutes altogether. Meats are all fresh and in small pieces. When rocking is finished fat must have the appearance of half the size of a coffee bean.

Another meat formula for breakfast sausage is as follows:

Shoulder Fat Pork Trimmings	25 lb.
Pork Butts Trimmed	25 lb.
Lean Pork Trimmings, 40% Lean (No Belly Trimmings)	50 lb.

"Skinless" Pork Sausage

Sausage meat for this product is stuffed in "NoJax" or similar casings, linked usually in about 4½-in. lengths, and handled and peeled in same manner as skinless frankfurts.

Following are two formulas for "skinless" smoked sausage:

For formula No. 1 use, per 100-lb. batch:

Lean Pork Trimmings, Cured	60 lb.
Regular Pork Trimmings, Cured	20 lb.
Lean Beef, Cured	20 lb.

Pork is ground through ⅛-in. plate. Chop beef very slightly so it will act as a binder and then add to pork in mixer. Care should be taken that no excess moisture is added as it will produce sourness in finished product. Mix well and season with proper amounts of salt, pepper and whatever other seasonings are desired.

Ready prepared seasonings or specially prepared seasonings as manufactured by reputable firms will assure convenience and uniformity in making this product.

Stuff mixture in 1⅛-in. "NoJax" or similar casing. Smoke in a cool house for 3 hours at 130° F. Then cook at 160° F. for about 10 minutes. Cooking is usually done in a steam house to prevent smearing. Sausage should be placed before a fan following cooking to dry off casing. This aids in prevention of any mould or bacterial growth.

Formula No. 2 uses, per 100-lb. batch:

Cured Pork Cheeks	50 lb.
Cured Regular Pork Trimmings	50 lb.

This formula is prepared in same manner as No. 1. Product must not be chopped too fine or cooked too much to prevent pork from becoming smeary and spoiling its appearance. Sausage should not be peeled or packed in boxes until ready for shipment.

Italian "Hot" Sausage

A good formula for this product is as follows:

Beef, Free of Sinews	60 lb.
Pork Trimmings (Half Regular and Half Lean)	40 lb.

Chop meats through the 1-in. plate and mix with following:

No. 3 Can Pimientos, Juice and All, Chopped to a Paste	1
Straight Ground Chili Pepper	1½ lb.
High Grade Paprika	1 lb.

If fresh meat is used in making the product 2 lb. of salt should be added. If meat is cured, the additional salt is not necessary. Also add:

Ground Caraway	1 oz.
Coriander	2 oz.
Celery	1 oz.
Nutmeg	2 oz.

After a thorough mixing, run the product through 3/32, 1/16 or ⅛-in. plate, depending upon fineness or coarseness of meat desired.

Stuff mixture in hog or manufactured casings, linked 6 to pound. This allows serving two sausages on average plate lunch. Put sausage into cook tank with water at 160° F. and let temperature drop back to 150°. Cook for 30 minutes or until an inside temperature of at least 137° is obtained.

This sausage can be smoked right after it is stuffed, smoking for half an hour in a cold smoke.

Any good bologna or frankfurt meat formula can be used for this sausage, cutting the meat coarser if desired and seasoning highly, with seasonings such as those suggested in the above formula.

Another meat formula which might be used is as follows:

Beef Chucks	70 lb.
Pork Cheek Meat	20 lb.
Back Fat Trimmings or Shoulder Fat	10 lb.

Grind beef and pork cheeks through the ⅛-in. plate; back fat trimmings through ⅜-in. plate.

Head Cheese

The following formula can be used to make an attractive product which is strictly a head cheese.

Meats:

S. P. Pork Tongues	60 lb.
S. P. Pork Snouts	20 lb.
Pickled Pork Ears	10 lb.
Pickled Pork Rinds	10 lb.

Seasoning:

Ground White Pepper	4 oz.
Caraway Seed	2 oz.
Marjoram	½ oz.
Ground Cloves	½ oz.

Prepared seasonings may be used if desired, such as those made by reputable seasoning manufacturers, to facilitate convenience in handling and uniformity of product.

Cook each kind of meat separately in nets, at 212° F. as follows:

Snouts	1½ hr.
Rinds	2 hr.
Ears	1½ hr.
Tongues	1¾ hr.

Grind skins through ⅛-in. plate of hasher. Snouts and ears should be put through 1-in. plate. These should be rinsed several times with warm water to remove surplus sediment and fat.

Remove gullet bones from pork tongues after cooking. Cut each tongue crosswise 3 times, making 4 approximately equal pieces, so that tongues will pass through valve of stuffing machine.

Put all meats together in a box truck, adding seasoning, jelly water and salt to taste. Not much salt will be required, as all meats used are pickle-cured. Use the hot meat liquid in which meats were cooked, and mix thoroughly.

Stuff tight in hog stomachs or manufactured casings. Fasten carefully and cook 1½ hours at 170° F. Wash clean and put into cooler at about 36°, or keep in ice water, to chill thoroughly before packing. Product must be clean and free of grease before packing and sale.

Some sausage makers add pimentoes or green peppers to give eye and taste appeal to their head cheese.

Curing and Smoking Frankfurters

Curing is best done by dry-curing hashed meats, by emulsion curing, or by a combination of both. In dry-curing hashed trimmings use per 100 lb. of meat, 3 to 3½ lb. of salt. Nitrate or saltpeter should never exceed 3 oz., while nitrite should never exceed ¼ oz. per 100 lb. of meat. A mixture of these is still better, namely ⅛ to ¼ oz. of nitrite and 2 to 2½ oz. of nitrate or saltpeter. The same proportions hold for the emulsion cure. Dry cured hashed trimmings may be used after 2 to 3 days, but they may also be kept 7 days. Emulsion cured meats are put through the fine cutter, and so cure rapidly. Thus they must be used promptly.

Every sausage maker knows that good muscle meats make good sausage and that cheeks and other such meats do not make sausage of quite as high a class. Less ice should be used in the summer than in the winter. For winter about 60 lb. of ice can be used per 100-lb. block of meat, but only 40-48 lb. should be used in the summer for first grade frankfurters. Less ice can be used with second and third grade frankfurters.

Frankfurters should be properly cured before smoking. If the emulsion cure is used in whole or in part, the meat or the sausage should be held a while for the cure to develop. Part of this may be done in the smokehouse. The smoke should start cool (about 90° F.) and finish at 130-135° F. for frankfurters and 140-145° F. for Vienna style frankfurters. For other smoked sausage the finish may be at up to 175° F. Cooking should follow promptly and the two operations should really be considered as one. Vat water should be 160°-165° F. while in the spray cooking process the water may be 180° F. Cooking should proceed until the temperature at the center of the meat is at least 140° F. while 148° F. gives better color and many believe it gives better texture and flavor.

German Ham

Since these hams are not cooked before they are eaten, all packers operating under federal inspection must follow B.A.I. rules for uncooked pork in making them. The way they make them in Germany is as follows:

Only hams with a pink meat color are chosen. They should weigh about 18 lb., and are long cut with some of loin end on. Hip bone should be removed.

For curing use a mixture of 25 lb. of salt and 4 oz. of sodium nitrate, or prepared curing mixture. This mixture is rubbed into the ham, especially the skin side, for about 5 minutes. Press some of salt into leg bone at cut. Place hams in a vat, and on each layer add enough of curing mixture so that all parts are lightly covered with it.

When vat is full it should be covered with boards with a weight on top. Curing will take 28 days at not less than 38° F. Repack 3 times during this period, so that top layer goes on bottom. Rub hams over again at each repacking.

At end of 28 days take hams out of vat and lay on floor in same temperature for 14 days, sprinkling curing mixture very lightly between each layer. At end of this period wash hams in warm water and hang in dry-room for 2 to 3 days.

Then smoke in a very cold smokehouse for not less than 6 weeks. In Germany these hams are sometimes smoked for 6 months.

Careful handling in cure will yield a tender product. Packers preparing this type of ham for the first time should cure only a small batch. In this way they can watch smoking and curing closely.

Bologna

To make and cure bologna in the silent cutter one sausage expert advises the use of all fresh meats, as follows:

Beef Chucks	70 lb.
Pork Cheek Meat	20 lb.
Pork Back Fat Trimmings or Shoulder Fat	10 lb.

Grind beef and pork cheeks through the ⅛-in. plate; back fat trimmings through ⅜-in. plate. Put beef and pork cheeks in silent cutter and add cure, as follows:

Salt	3 lb.
Sodium Nitrate	2 oz.
Nitrite of Soda	¼ oz.
Sugar	6 oz.

and proceed as if using cured meats.

Add ice and water up to 20 lb. per 100 lb. of meat, and chop for 3 minutes. Then add pork back fat and seasonings:

Ground White Pepper	6 oz.
Ground Allspice	1 oz.
Coriander	2 oz.
Ground Nutmeg	2 oz.

Chop 2 minutes more. Then put in a meat truck or pans not over 6 in. deep, and hold in cooler at 36 to 38° F. over night or about 12 hours. Next morning stuff and let sausage hang in room temperature for 1 to 2 hours. Then smoke, slowly at first, gradually increasing temperature from 120 to 145° F. Cook 45 minutes at 160° F.

This method has the advantage of saving a lot of labor, decreases inventory holding and produces a fine, tacky product.

Non-Discoloring Salami

Discoloration is usually due to curing methods. To make either hard or soft salami, meat should be cured as follows:

Use 2¾ oz. of sodium nitrate for each 100 lb. of meat. Beef requires 3 lb. of salt and pork 2½ lb. for each 100 lb. of meat cured. Run meat through 1-in. plate with above curing materials and then cure for at least 8 days at a temperature of about 40° F. Then place in mixer, add 9 oz. sugar and 6 oz. of pepper, and mix pork and beef together. Grind mixture through desired plate, either ¼-in. or ⅜-in.

Stuff material tightly in large hog bungs, beef middlings or manufactured casings, as tightly as casing will stand. Hang in a dry chill room for 4 days. Then remove to sausage kitchen and hang for at least 6 hours so it will be raised throughout to room temperature before it goes to smokehouse. It may either be smoked through or smoked 12 hours and finished in cooker.

"Smoked through" means about 24 hours at slow smoke at 90 to 100° F. Then gradually raise temperature to about 140° so that product will have a 137° temperature at center when finished. Remove from smokehouse and rinse off with cold water; allow it to cool before placing in chill room.

Meat from full grown animals should always be used for hard sausages, such as jumbo shoulder trimmings and large beef chucks with all sinews removed.

A good meat formula for salami is as follows:

Lean Pork Trimmings	50 lb.
Medium Lean Beef Chucks (Free of Sinews)	35 lb.
Back Fat	15 lb.

These meats should be cured according to directions given previously.

The product may be seasoned with:

Crushed Garlic	1¼ oz.
Sugar	9 oz.
Brandy Flavoring	5 oz.
Ground Anise Seed	1 oz.
Ground Cardamom	½ oz.
Maple Flavor	3 tbsp.

Coloring and Flavoring for Meats
British Patent 425,567

Hæmoglobin, Defibrinated	100 oz.
Sodium Nitrite	5 oz.
Sodium Nitrate	1⅔ oz.
Water	100 oz.

Stir well for a few hours. Spray dry or vacuum dry. 1% of this product is used on meats.

Preserving Color of Meat
U. S. Patent 2,009,587

By coating freshly cut meat surfaces with a glycerin-gelatin-water solution containing a small amount of essential oil, the natural fresh color and appearance of the meat is maintained.

Various essential oils, such as oil of cloves, may be used, or a mixture of oil of black pepper, coriander and allspice.

One typical formula for such a solution that has been found satisfactory consists of 57% water, 25% glycerin, 18% gelatin, and substantially 0.1% of essential oil. This solution may be applied with a brush or spraying device on cloth placed over the cut surface of the meat.

The entire piece of meat may be wrapped in fabric such as export beef cloth or the fabric may be applied only on the cut surfaces. The coating is then allowed to congeal. The glycerin, being hygroscopic, preserves the gelatin in a flexible condition, thus avoiding cracking. The essential oil acts as a germicide, while the gelatin acts as a hermetic seal.

Export beef cloth has been found superior to other fabrics for keeping the preservative solution in contact with the meat.

Preserving Vegetables and Fish

Dutch Patent 34,553

A procedure for keeping fruit, vegetables, etc., in a fresh condition has been devised. It is especially adapted for the prevention of mold, fungi, and other micro-organisms developed during storage. The procedure consists in rendering the air of the storeroom slightly alkaline, so that moist indicator paper showing a color change at $pH = 7.5$ is affected on introduction into the chamber. In order to render the storeroom alkaline, materials which furnish volatile, alkaline substances are burnt slowly.

Preventing Mold on Stored Meats

The humidity of the cooler should be 90 to 92% and the temperature 38–39° F. Ozone is introduced until it is present in 2.3 to 2.7 parts per million. This is continued for 2 hours and again for 2 hours after a lapse of 12 hours. After an interval of 30 minutes, workmen can safely enter the room.

INKS AND MARKING COMPOUNDS

Ink for Documents

Gallic Acid	5	g.
Borax	0.5	g.
Picric Acid	2	g.
Ammonia	20	g.
Water	50	g.

Dissolve with warming and stirring.

Water	50	g.
Caustic Potash	1	g.

Boil and stir the mixture until pale brown, let stand warm for an hour, then add the following dissolved by boiling.

Water	200	g.
Borax	1.5	g.
Shellac	3	g.
Aniline Blue	4	g.

Non-Corrosive Writing Ink

Gall Nuts	28	g.
Aniline Blue	6	g.
Ferrous Chloride	30	g.
Glycerin	2	g.
Hydrochloric Acid	30	cc.
Arsenic Acid	1	g.
Phenol	1	g.
Water	1000	l.

Powdered Writing Inks

Formula No. 1

Gallic Acid	10	g.
Ferric Sulphate	10.7	g.
Oxalic Acid	2	g.
Soluble Blue Dye	3.5	g.

Formula No. 2

Gallic Acid	10	g.
Ferrous Sulphate Crystals	15	g.
Tartaric Acid	1	g.
Soluble Blue Dye	3.5	g.

Indelible Inks

Formula No. 1

a. Chinese Gall Nuts, Powdered	750	g.
Water, Hot	3000	g.

Stir, keep standing 2 days, then press out extract; add to the extract:

b. Ferric Sulphate in Water, (sp. gr. 1.48)	48	g.
Solution, Saturated, of Oxalic Acid	18	g.

Pour this into:

Water	180	g.
Indigo Carmine, Paste in Water	36	g.
Wood Vinegar, Crude	15	g.

Dye for Black Writing: per 1000 cc. Ink add:

Phenol Blue 3F	1.8	g.
Ponceau RR	1.2	g.
Aniline Green D	1.2	g.

No. 2

Indelible Ink, Stable Against Water, Oil, Alcohol, Alkali, Oxalic Acid, Chlorides

a. Shellac	4	g.
Borax	2	g.
Water	36	g.

Boil till dissolved.

b. Gum Arabic	previously dissolved	2	g.
Water		4	g.

Mix *a* and *b*, boil, filter, cool, add

c. Indigo Carmine to desired color

Note: Just traces of sulphuric or hydrochloric acids or salt make ink indelible.

Ink for Writing on Celluloid

Ferric Chloride	10	g.
Tannic Acid	15	g.
Acetone	100	cc.

Dissolve the ferric chloride in a portion of the acetone and the tannic acid in the remainder and mix the two. Use any pen.

Black India Ink

a. Borax	0.3	g.
Shellac, Wax-Free	1.5	g.
Water (Boiling Hot)	4	g.
b. Black Tar Dye, Water-Soluble	0.1	g.
Water	4.1	g.

Mix cold.

Non-Coagulating India Ink

Japanese Patent 110,282

Glue (Previously Heated at 120° C. for 3 hr.)	30	oz.
Urea	10	oz.
Potassium Nitrate	60	oz.

Urotropine	10 oz.
Carbon Black	60 oz.
Water	1000 oz.

This ink will not coagulate at temperatures down to —30° C.

Silver Glow Ink

Tin	1 oz.
Mercury	2 oz.

Grind together until liquid; then grind with 1 pint of 2% gum arabic solution. When used as an ink the writing will resemble silver.

Marking Ink for Chemical Porcelain

Cobalt Oxide, Black Commercial	18.8 g.
Bismuth Subnitrate	1.2 g.

Grind these together thoroughly with

Turpentine	15 cc.
Dresden Thick Oil	15 drops

Mark the porcelain with a pen, heat slowly to evaporate the liquids, and then ignite strongly. The porcelain apparatus is then ready for use.

Ink Erasing Fluid

An alkali hypochlorite, first applied to the ink to be removed; followed by an application of dilute acid, will remove ink from paper.

Ink for Glass or Polished Metal

Sodium Silicate	2 oz.
Liquid India Ink	10 oz.

Use on clean surface with a steel pen.

Ink for Glass

Turpentine	20 g.
Venice Turpentine	6 g.
Shellac	10 g.
Mastic	2 g.
Lampblack	6 g.

The lampblack is added gradually to the mixture of other ingredients. This ink is very efficient for writing on glass photographic plates and lantern slides.

Stencil and Marking Ink
U. S. Patent 2,002,939

Shellac Solution (4 lb. per gal.)	32 oz.
Turpentine	5.3–6 oz.
Beeswax	2.0–2.3 oz.
Lampblack or Chrome Yellow	5.7–8 oz.
Alcohol	80–167 fl. oz.

Ink for Writing on Carbon Paper
U. S. Patent 1,988,723

Titanium Dioxide	1 oz.
Mineral Oil	2 oz.
Mineral Spirits (Naphtha)	4 oz.

Carbon Paper Ink
French Patent 774,922

Cottonseed Oil	1 lb.
Prussian Blue	1 lb.
Carnauba Wax	2 lb.
Paraffin Wax	2 lb.
Ozokerite	½ lb.
Octadecyl Alcohol	1 lb.

Transfer Ink
U. S. Patent 1,990,193

Carnauba Wax	3 lb.
Boiled Linseed Oil	2 lb.
Caustic Soda	0.375 lb.
Pigment	to suit

Thermographic Printing Ink
U. S. Patent 1,992,016

Paracumarone Resin	100 lb.
Dibutyl Phthalate	50 lb.
Butyl Stearate	50 lb.
Drier	2½ lb.

Rotogravure Ink
French Patent 776,825

Ethyl Cellulose	5 lb.
Alcohol	155 lb.
Alcohol Soluble Dye	40 lb.

Offset Printing Ink
U. S. Patent 1,989,250

Pigment	34.4 lb.
Linseed Oil	21.5 lb.
Varnish	33.2 lb.
Castor Oil	2.2 lb.
Stearin	3.7 lb.
Turpentine	5 lb.

Intaglio Printing Ink
U. S. Patent 1,962,823

A pigment is used with the following binder:

Rosin	2 lb.
Caustic Potash (10%)	1.6 lb.
Casein	0.1 lb.
Ammonia (sp. gr. 0.91)	0.24 lb.
Turpentine	0.2 lb.
Water	4 lb.

Lithographic Bronze Printing Ink Varnish

German Patent 604,019

Polymerized China Wood Oil	10 lb.
Linseed Oil, Boiled	5 lb.
Turpentine	2 lb.
Carnauba Wax	1 lb.

Polymerize China wood oil at 240–280° C., add linseed oil and heat to 200° C. for 2 to 3 hours. Cool and add the carnauba wax and turpentine.

About 9 lb. of above is stirred with 16 to 18 parts bronze powder.

Printing Lacquer

U. S. Patent 1,996,846

Nitrocellulose about 10 parts, ester gum about 25 parts, xylol about 30 parts, fenchone about 30 parts, dibutyl phthalate about 5 parts and pigment about 25 parts relative to the total of the other ingredients.

Solid Color for Rubber Printing Blocks

Hansa Yellow	200 g.
Alcoholic Shellac (50%)	50 g.
Borax	50 g.
Water	250 g.

Ink for Rotary Press

Pit Coal Tar (Density 0.85–0.89)	100 g.

Treat warm with:

Sulphuric Acid (66° Bé.)	3 g.

then neutralize with stirring by Soda Ash. Deodorize with calcium chloride and hydrochloric acid.

Above Tar plus

Pig Fat	5 g.
Glycerin	4 g.

To this liquefied and cleared varnish add

Campêche Extract	4 g.

to obtain:

Black, brown or violet coloration with

Alum
Copper Sulphate
Potassium Bichromate

Finally mix with

Lamp Black	10 g.

Typographic Ink for Newspapers

Colophony Tar	37 g.
Rosin Oil, Rectified	40 g.
Thinner: Petroleum	20 g.

Filter hot.

Newspaper Ink

Pit Coal Tar (0.85–0.89 Density)	1 kg.
Linseed Oil Boiled with Litharge	4 kg.
or	
Linseed Oil-Colophony Varnish	4 kg.

Pyroxylin Printing Ink

Ethyl Oxalate	10 lb.
Nitrocellulose (½ sec.)	3 lb.
Dye (Basic)	2 lb.
or	
Pigment	2 lb.

Typographic Ink

Red Yacca Gum, Powder	15 g.
Borax Solution, Boiling	4 g.
Glycerin	1 g.
Gum Arabic	2 g.
Soluble Nigrosine	5 g.
Water	73 g.

Water-Soluble Printing Ink

Glycerin	100 oz.
Gum Arabic	50 oz.
Water Soluble Dye	10 oz.

Lithographic Color Ink

Glycerin	10 g.
Copaiba Balsam	20 g.
Venice Turpentine and Sandal Wood Oil	5 g.
Petroleum Oil	2.5 g.
Pine Turpentine	2.5 g.
Alcohol	5 g.
Manganese Dioxide	2.5 g.

This mixture, prepared on the water-bath, is thinned with

Chloroform	16 g.
Ether	16 g.
Ammonia (28° Bé.)	31 g.

Lithographic Ink for Reproductions

Resin, Damar	12 g.
Petroleum Oil	2.8 g.
Glycerin	32 g.
Linseed Oil Varnish	24 g.
Color	2–8 g.

Fusible Lithographic Ink

Damar	50 oz.
Kerosene	100 oz.
Pigment	100 oz.

Fine Lithographic Ink

Asphalt (Gilsonite plus 60% of Rosin Oil plus 70 to 120% of Rectified Tar)	15 g.
Pit Coal Tar	30 g.
Paris Blue	2 g.
Bone Black	3 g.
Lamp Black	23 g.

To get a typographic ink, increase the proportion of tar, and reduce sensibly the proportion of the color.

Typographic Ink for Prints

Colophony Tar	95 g.
Rosin Oil (Medium, Neutral, Rectified)	50 g.
Linseed Oil, Light	13 g.

Lithographic Inks with Oil-Varnishes Thickened by a Resin

Glycerin	40 g.
Varnish, Medium	40 g.
Soda Ash	2.8 g.
Cream of Tartar	1.4 g.
Venice Turpentine	16 g.
Color	6–34 g.

Tartar and soda are first dissolved in glycerin.

Varnish for Lithographic Inks

Sandarac	15 kg.
Olive Oil	15 kg.
White Beeswax	12.5 kg.
Stearic Acid	12.5 kg.
Oleic Acid	2.5 kg.
Castile Soap	2.5 kg.
Burgundy Pitch	40 kg.
Stearin Pitch	10–20 kg.

Varnish for Artistic Prints
Medium Strength

Colophony, Pale	110 g.
Copaiba Balsam	70 g.
Tolu Balsam	2.5 g.
Benzoin Amygdaloid	3 g.
Linseed Oil	50 g.

Dissolve hot.

Medium Varnish (for Inks)

Rosin Oil	50 g.
Sulphonated Rosin Oil Soap	3.5 g.
Boiled Weak Linseed Oil	4 g.
Boiled "Middle" Linseed Oil	52 g.
Colophony	25 g.

By removing the weak linseed oil, a strong varnish is obtained.

Medium Varnish (for Inks)

Rosin Oil	95 g.
Crude Linseed Oil	35 g.
Sulphonated Rosin Soap	7 g.
Colophony	40 g.

Evanescent (Invisible) Inks
Formula No. 1

Cobalt Chloride	1 dr.
Mucilage of Acacia	1 dr.
Distilled Water	1 oz.

Dissolve. The writing becomes blue when the paper is heated, and disappears again on cooling.

No. 2

*Oxalomolybdic Acid	15 gr.
Distilled Water	1 oz.

Dissolve. Write with this in a dull light. When exposed to sunshine, the writing appears blue; when wetted, the blue changes to black.

* Made by dissolving Molybdic Acid to saturation in a hot solution of oxalic acid, and collecting the crystals on cooling.

No. 3

Nickel Chloride	10 gr.
Cobalt Chloride	10 gr.
Distilled Water	1 oz.

Dissolve. The writing becomes green on heating.

No. 4

Lead Acetate	10 dr.
Distilled Water	1 oz.

Dissolve. The writing is invisible, and becomes black when damped with a sulphide solution.

Billiard Chalk
Formula No. 1

a.	Calcium Carbonate, Precipitated	115 g.
	Gypsum, Calcined	35 g.
	Pigment Powder (Blue, Green)	50 g.
b.	Borax Water (2%) about 180–200 g. to make a pasty liquid	

This paste is poured into slightly oiled molds.

No. 2

Calcium Carbonate	100 g.
Gypsum	30 g.
Borax Water (2%)	115–130 g.

As above.

Cellulose Tranfer Inks
Formula No. 1

Cellulose Acetate	170 oz.
Triacetin	200 oz.

High Phenol Resin	200 oz.
Pigment	250 oz.

No. 2

Nitrocellulose (½ sec.)	15 oz.
Triphenyl Phosphate	20 oz.
Blown Castor Oil	5 oz.
Basic Dye	2 oz.
Acetone	50 oz.

No. 3

Nitrocellulose (½ sec.)	15 oz.
Glyptal Balsam	20 oz.
Stearic Acid	5 oz.
Pigment	10 oz.
Acetone	50 oz.

No. 4

Nitrocellulose (½ sec.)	15 oz.
Phenol Formaldehyde Resin	25 oz.
Beeswax	50 oz.
Acetone	50 oz.

No. 5

Triphenyl Phosphate	50 oz.
Butyl Tartrate	50 oz.
Cellulose Acetate	50 oz.
Mineral Oil	5 oz.
Basic Dye	20 oz.

No. 6

Ethyl Cellulose, High Viscosity	50 oz.
Castor Oil	25 oz.
Mineral Oil	10 oz.
Bronze Powder	20 oz.
Benzol	50 oz.

Emulsifiable Transfer Ink

Diglycol Stearate	20 oz.
Ethyl Cellulose	5 oz.
Sodium Abietate	10 oz.
Pigment	10 oz.

Ink Remover

For cleaning dry printing ink from printers' rolls and type.

Denatured Alcohol	2½ gal.
Commercial Toluol	1¼ gal.
Heavy Naphtha	3¾ qt.
Creosote Oil	1¼ gal.

Non-Inflammable Ink Remover
(for Washing Printers' Rolls and Type)

Carbon Tetrachloride	10 pt.
Toluol	13 pt.
Heavy Naphtha	11 pt.
Creosote	2 pt.

Printing Form Cleaner

Use light gasoline.

Printing Roller Cleaner

High Test Benzine	90 fl. oz.
Petroleum	10 fl. oz.

General Printing Cleaner

High Test Benzine	80 fl. oz.
Xylene	15 fl. oz.
Petroleum	5 fl. oz.

Intaglio Printing Press Cleaner

High Test Benzine	80 fl. oz.
Tetralin	20 fl. oz.

Off-Set Printing Cleaner

Use light petrol (gasoline).

Ink Remover
U. S. Patent 1,968,304

A substantially non-aqueous cream for the removal of ink stains from the skin containing about 500 g. of zinc stearate, about 300 g. of citric acid, about 500 cc. of 95% ethyl alcohol and about 2000 cc. of diethylene glycol.

Ink Eradicator

Potassium Alum	2 lb.
Citric Acid	2 lb.

Mix thoroughly and dissolve in

Water	3 lb.

Stencil Coating Paste
U. S. Patent 2,011,898

Formula No. 1

Calcium Oleate Solution

Calcium Oleate	20 oz.
Mineral Spirits	80 oz.

The above ingredients are combined by heating for a short time in a steam-jacket kettle.

No. 2

Ammonium Stearate Solution

Ammonium Hydroxide (sp. gr. 0.9)	0.41 oz.
Water	98.84 oz.
Stearic Acid	0.75 oz.

The stearic acid is broken up into small pieces and agitated with the other ingredients until dissolved.

No. 3

Ammonium Oleate Solution

Ammonium Hydroxide (sp. gr. 0.9)	0.41 oz.
Water	98.84 oz.
Oleic Acid	0.75 oz.

The above ingredients are combined in the same way as those of No. 2.

Suitable compositions for stencil paste in which the false bodying agents are incorporated are given below. The composition of the particular resin used is given after the examples setting forth the stencil paste compositions.

No. 4

White Stencil Paste

Lithopone	46.1 oz.
Zinc Oxide	23.1 oz.
*Resin A	15.7 oz.
Drier	1.5 oz.
Ammonium Stearate Solution of No. 2	2.3 oz.
Calcium Oleate Solution of No. 1	4.8 oz.
Mineral Spirits	6.5 oz.

No. 5

The same composition as No. 4 except that 23 parts of the lithopone are replaced by 23 parts of diatomaceous earth. The effect of the soap solutions described in the preceding examples is enhanced by the use of cellular or fibrous materials such as diatomaceous earth or "Asbestine."

No. 6

The same composition as No. 4 except that basic lead carbonate is substituted for lithopone.

No. 7

The same composition as No. 4 except that resin B is used instead of resin A.

No. 8

Black Stencil Paste

Carbon Black	17 oz.
"Asbestine"	4.1 oz.
†Resin B	64 oz.
Drier	4.1 oz.
Ammonium Oleate Solution of No. 3	7.2 oz.
Calcium Oleate Solution of No. 1	3.6 oz.

No. 9

The same composition as No. 8 except that 7.2 parts of ammonium oleate solution are replaced by 4 parts of mineral spirits and 3.2 parts of calcium oleate solution of No. 1.

No. 10

Red Stencil Paste

Toluidine Red	19.8 oz.
Barytes	28.6 oz.
*Resin A	21.8 oz.
Ammonium Stearate Solution of No. 2	15.4 oz.
Mineral Spirits	12.8 oz.
Drier	1.6 oz.

The linseed oil modified resin given in this formula may, if desired, be replaced by a resin modified by linseed oil acids such as indicated by resin C below.

The ingredients in the pastes described above are combined in accordance with the usual products of paint manufacture.

The following resins are illustrative of the class of polyhydric alcohol-polybasic acid resins especially suitable for the purposes of the present invention. These resins are made in the conventional way by reacting the ingredients in the proportions indicated.

*Resin A

Glycerol	12.8 oz.
Phthalic Anhydride	28 oz.
Linseed Oil	59.2 oz.

†Resin B

Glycerol	15 oz.
Phthalic Anhydride	35 oz.
Linseed Oil	50 oz.

Resin C

Glycerol	17.1 oz.
Phthalic Anhydride	27.1 oz.
Linseed Oil Acids	55.8 oz.

LEATHER, SKINS, FURS

Chamois Leather from Rejected Calf Skins

The skins are soaked, pasted with sodium sulphide 1 and calcium oxide 4 (25° Bé.) at a temperature not exceeding 30° C., limed with calcium oxide 10 g. per liter, sodium sulphide 4 g. per liter, water 400%, at 20° during 18–20 hours, washed with water at 22° for 40 minutes, fleshed, treated with 0.3% hydrochloric acid and 2% sodium chloride (of the weight of the raw skins) at 25°, softened with a concentrated softener (0.1% of the weight of the raw hide), for 1 hour at 35–37°, pickled for 40 minutes with hydrochloric acid 1.7, sodium chloride 7 and water 80%, tanned with chrome extract of 2% chromic oxide, having a basicity of 50%, split, neutralized, washed, greased, with 0.5% alizarin oil, 2% egg yolk and 150% water, washed with water at 35°, dried at 35°, let stand 2 days, dehaired in sawdust, stretched, cut, sand-papered and soaked.

Chamois Leather of Natural Color from Rejected Kid Skins

The skins are soaked in water at 18–20° C., drummed for 45 minutes at 17°, fleshed, soaked again in water at 16–17°, drained and treated with a mixture of sodium sulphide 2%, calcium oxide 5% (of the soaked skins) of 30° Bé. at a temperature of 35–40°. The hair is removed by hand and the skins are placed in a lime solution for 5 days at 12–16°. They are then washed for 30 minutes, split, the thin parts are tanned by the formalin-fatty method and the heavier parts are chrome-tanned. The flesh side is treated with 0.5% hydrochloric acid for 45 minutes. The skins are further pressed and drummed in 5% of seal fat, and treated in an oxidizing chamber for ½ hour at 32–35°. The above processes are repeated except that the oxidizing drying is carried out at 40–42°. The product is stored for 3 days, degreased with 200% water at 45° and sodium carbonate solution (5% of the weight of the skins) is added, the liquid discharged and the above soda solution again added together with water. The goods are soaked with water at 40–45°, drained, dried and stretched. They are dyed with nigrosine, drummed for 6–7 minutes and fat liquored with 0.75% castor oil, 2% alizarin soap and 2% rosin soap.

Velure from Rejected Pig Skins

Soak the raw hide in pieces weighing 1–3.5 kg. to a liquid factor of 1.5, at 20° C. and for 2 hours treat with 1 part sodium sulphide and 3 parts calcium oxide, density 25° Bé., at 25° let stand for 3–6 hours, unhair, wash and sort. Then treat with sodium sulphide 10 g. and calcium oxide 10 g. per liter at 20° for 4 days, split to an average thickness of 1.25 mm. and wash to a liquid factor 1:5 at 20° for 2 hours. Treat with concentrated softener 0.5% at 37° for 2–3 hours, de-ash with bisulphite 2% at 28° at a liquid factor 1:5; wash to a liquid factor of 1:5 at 25° and during 30 minutes. Pickle with sulphuric acid 2%, sodium chloride 10% and water 80% for 40–60 minutes at 18°. Tan with chrome extract containing chromic oxide 1.8, basicity 45 and water 80%; to complete tanning the basicity may be raised if necessary. Neutralize with bicarbonate 1.25 and water 200% at 35°, wash with water 300% at 40° for 30 minutes. Fat liquor with alizarin oil 1, egg yolk 3, water 150% at 40° for 40 minutes, and wash with water 300% at 35° for 25 minutes. Dry at 35°, unhair in sawdust containing 60% water for 16–20 hours, stretch, cut and polish.

Chrome-Tanned Black Calf-Leather Chamois

A calf leather which was previously tanned is planed on the grain side, neutralized, treated with 2% of pure fats, dried, unhaired and nailed on frames. The skin is then worked over with grinding stones and the final treatment is given with pumice stone. Skins with a light nap are worked over with a wire brush (by hand). The skins are finally dyed with 15% (of their dry wt.) of substantive dyes and 4.5% ammonia, the mixture being diluted with 50% water.

Preparing Leather from the Mucous Stomach Membrane of Cattle

(1) The material is soaked, slightly fleshed, limed for 2 days, with about 12% slaked lime on the weight of the tissue, washed and delimed with bisulphite. Tanning by vegetable or by one-vat or two-vat chrome methods is followed by the usual dyeing, fat liquoring, drying and finishing. (2) The membrane is soaked for 2 hours in cold water, then for 15–20 minutes each in 3 vats with a gradually increasing temperature from 22° C.

Removing Scales from Shark Skins

Give the skins a salting in a 1% solution of sodium chloride. Then a treatment in a ½% solution of hydrochloric acid. This method should dissolve the scales, but if for any reason it does not, keep on increasing the percentages of both materials. Then give the skins a thorough washing in pure water in a drum. Watch carefully that the hydrochloric acid does not attack the skins themselves.

Loosening Hair from Hides
Canadian Patent 353,326

Wheat Shorts	14	lb.
Wheat Bran	6	lb.
Phenol Solution (2½%)	0.6	cc.
Water	15	gal.

Preparing Pigskins for Tanning

First, scrape the raw skins until they are nearly dry. Then give them a good soaking for a day or two. Next wash them in a drum or vat containing a warm solution of sal soda or similar product for loosening the grease. In preparing this solution, use from 1% to 2% of sal soda according to the condition of the skins, i.e., they appear to be extremely greasy, a higher percentage of sal soda is preferred. After the skins have received a thorough soaking in this solution, strike them out thoroughly with a dull knife, forcing out as much grease as possible. Very greasy skins should be struck out two or three times. Then rinse them off in warm water and soak them overnight in cold water, after which they are unhaired and limed.

As pigskins absorb tan liquors somewhat slower than calf and other skins, it is good practice either to give them slightly stronger liquors or a longer time in the same strength liquors you are using for your other stock. This suggestion applies more especially to a vegetable tannage.

Pigskins being of a very greasy nature require less oiling or fat liquoring than other skins. Some tanners reduce the oiling from 20% to 30%.

Felting Animal Hair
German Patent 608,770

Hair is rendered capable of fulling and felting by treatment with a bath containing small amounts of oxy acids of metals of the chromium group or their salts together with hypochlorous acid or persulphuric acid or their salts. Thus pelts are treated with an aqueous solution containing 2% potassium chlorate, 1% nitric acid and 0.1% chromium in the form of dichromate at 10–100° C., and dried.

Treating Lizard Skins

Bleaching should be effected in two solutions. (1) potassium permanganate 5 g. per liter, sulphuric acid 1 g., water 500% of the weight of the skins, and (2) water 500%, bisulphite 25 g. per liter. The washed skins are dyed beige by treating with 0.03% orange PB, 0.04% methanyl yellow and 200% water for 20 minutes, adding 0.3% acetic acid and treating 20 minutes. For gray use nigrosine 0.1%, acid brown 0.01% and water 200% at 45° for 15 minutes; add 0.3% acetic acid and treat for 15 minutes. For violet use wool brown 0.5% and acetic acid 0.5% at 45°, add 0.1% methyl violet after 30 minutes and treat for 15 minutes. For blue use sulphone acid-blue 0.3% and water 200% at 45° C. for 15 minutes, add 15% acetic acid and treat for 20 minutes.

Bleaching Deer Skin

Formula No. 1

Make a bath with

Hydrogen Peroxide (30%)	5–8	lb.
Seignette Salt	0.5	lb.

and put the skins into it for ½ hour. Dry them thereafter at 30° C. If the skins are not pale enough, repeat in the same bath.

No. 2

Put skins into a solution of

Potassium Permanganate	3	lb.
Sulphuric Acid	0.5	lb.
Water	96.5	lb.

for 30 minutes, moving repeatedly.

Wash out in cold water, then in solutions of

Sodium Bisulphite Powder	5 lb.
Water	95 lb.

(for ½ a minute), and

Hydrochloric Acid	5 lb.
Water	95 lb.

(for ½ minute).

Then wash out very carefully, repeat the process until the wanted paleness is reached.

No. 3

Tanning After Bleaching (Often Advisable)

Wash for 2 hours at 30–35° C. in solution of sodium carbonate, spill with water, and treat for 7 hours in a solution of

Sodium Carbonate	2 lb.
Formaldehyde (40%)	2.5 lb.
Water	95.5 lb.

Tanning Greenland Seal Skins

The sorted skins are soaked in water for 10 minutes, fat is removed from the flesh side and the skins are again soaked in water for 36 hours with change of water at 12-hour intervals. They are degreased in a drum charged with water of 30° C. with addition of 1% sodium hydroxide (calcined on the salted skins). The skins are washed in running water for 30 minutes, drained on racks for 2 hours, placed for 30 minutes at 25–30° in a solution prepared from sodium sulphide 20 g. per liter and calcium hydroxide 160 g. per liter, unhaired with a tool, washed till the concentration of sodium sulphide amounts to 20–25 g. per liter, and treated for 2 days in a lime solution used once for unhairing, with addition to the solution of 12 g. calcium hydroxide in the course of the processing. The skins are then washed, split, delimed and tanned in a six-vat battery for 6 days, with a 4° Bé. solution in the first and 4.25° Bé. in the last vat. The drum tanning may be carried out in an oak extract of 7° Bé. The aging in stacks requires 24 hours and the deacidification, which is carried out with 1° Bé. solution during 4 hours, is followed by washing in running water for 8–10 hours.

Tanning Horsehide

Full Grain Horse for Glove and Sport Goods

Having selected hides after unhairing for this type of leather, they are pickled, tanned, pressed, staked, etc., in the same manner as buffed glove horse. The stock is then split and shaved. After this it is neutralized and fat liquored in the same manner as for the "One Bath" tanned stock which is given below.

One Bath Tannage for Full Grain Horse

Often a tanner prefers to tan glove horse leather with the single bath tannage rather than with the two bath tannage. The final results will be the same, as both tannages produce excellent leather.

After lime splitting, the stock is bated and washed and taken to the chrome tan wheels. Maximum loads of 3000 lb. of lime split stock are considered sufficient. The tannage is based on this weight.

Place the stock into the drum with 180 gal. of water and 180 lb. of salt, mill for 10 minutes, then add 45 lb. 66° Bé. sulphuric acid in 15 gal. of water. Mill for 75 minutes, then add 42 gal. of chrome liquor.* This is added in three doses of 14 gal. each, 30 minutes apart. After the last addition is made, continue milling for 4 hours, let stand in drum over night.

The following morning mill the stock ½ hour, then add:

Fifteen pounds bicarbonate of soda, first dissolved in 20 gal. of water. Add this at the rate of 1 gal. every 2 minutes; continue milling 30 minutes, remove from the drum, lay flat on trucks, let drain for 24 hours, set out, split and shave.

* The chrome liquor used for this purpose is made as follows:

Bichromate of Soda	1000 lb.
Aluminum Sulphate	400 lb.
Sulphuric Acid, 66° Bé.	800 lb.
Corn Sugar	250 lb.
Total Volume	500 gal.

Use a lead lined tank. Place the bichromate, aluminum sulphate and 200 gallons of water into the tank, agitate well by means of an air line, then add the sulphuric acid. The corn sugar is made to a syrup with water and is added very slowly, taking the usual precautions.

After all the sugar has been added, add five gallons of bisulphite of soda, 33° Baumé, boil the liquor for one-half hour, allow to cool and make up to 500 gallons, stir well and allow to age ten days before using.

Coloring

Divide the tanned split stock into lots of 400 lb. each for coloring and fat liquoring. Place the stock into the drum with 120 gal. of water at 90° F., then add 6 lb. of bicarbonate of soda dissolved in 20 gal. of water, and mill for ½ hour. Drain the drum and wash the stock for 1 hour at 80° F., again drain

the drum and add 200 gal. of water at 120° F.

Prepare the following dye mixture:

Fustic Crystals	2	lb.
Resorcin Brown	4¼	oz.
Fast Red	½	oz.

Boil together in 30 gal. of water, cool to 125° F., and add to the drum. Mill stock in the dye solution for ½ hour, then drain the drum.

This will produce a cream color which is a standard for glove and sport goods stocks. The amount and type of fat liquor determine the purpose to which the stock will be used.

Fat Liquor for Stretchy Glove Leather

Sulphonated Cod Oil	24 lb.
Sulphonated Mineral Oil	24 lb.
Sod Oil	24 lb.
Borax	4 lb.

Place the materials into a barrel in the order given, stirring well upon addition of each item. Add 25 gal. water and heat by means of a steam jet agitator to 160° F. The total volume should be 50 gal. This emulsion is added to the drum after draining off the exhausted dye solution. Mill for one hour, rinse very slightly with water at 100° F., take out of drum and horse up for 24 hours, then hang up to dry.

Fat Liquor for Sporting Goods Leather

Sulphonated Mineral Oil	64 lb.
Sod Oil	24 lb.
Borax	4 lb.

Place the materials into a barrel in the order given, stirring well. Then add 25 gal. of water and heat by means of a steam jet agitator to 160° F. The total volume should be 50 gal. This emulsion is added to the drum after draining off the exhausted dye solution. Mill for 1 hour, rinse slightly with water at 100° F., take out of drum, horse up 24 hours, then hang up to dry.

Drying

This type of leather can be dried rapidly. Since it is quite wet, the initial air temperature can be 120 to 130° F. Rapid circulation of the air must accompany the high temperature; the moist atmosphere is gradually expelled from the dry room, emitting at the same time fresh air and reducing the temperature, so that the stock is thoroughly dried in 24 hours.

Crusted Stock

After the stock is dry it is crusted for five days. Dip the crusted stock in water at 110° F. for one minute, place into bins, cover well with damp burlap and allow to mull for four hours. Then place into damp sawdust (containing about 35% moisture) and let it rest for 24 hours. Then stake on a Slocum Machine and hang up to air off for an hour.

Dry Mill

After the stock has aired, place into a dry mill. For each 100 sides use 10 to 20 lb. of French chalk, the amount depending upon the size of the stock. Dry mill for 1 hour. Remove from dry mill and stake on the Baker Machine. After the second staking, polish the grain on a shearling wheel.

Notes: Some adjustments may have to be made for either the "one bath" or the "two bath" operations. In a greater number of cases the adjustment is made in the fat liquor stage, either increasing or decreasing the amount. Drying of the stock must be carefully controlled since this operation is very important to a soft, yet full feeling leather.

Leather of this type should not be tacked. Leather of this type should be stretchy, the glove more so than the sport leather. The latter is used principally for baseball gloves.

Black Garment Horse Leather

This type of leather is used principally for coat stock, although it can also be used for glove purposes. The market for this leather is highly competitive and therefore the leather must be made as economically as possible. Sheep, in grain and suede, is used very extensively and is produced at a low cost including the raw material. Because of this, it has found a greater market than horse leather. For general utility and durability, horse garment leather excels sheep leather.

The stock is sorted in the beamhouse before bating. The butts should be split down to a minimum. After bating and washing, the stock is transferred to the chrome tan yard.

A maximum drumload of 3000 lb. of lime split stock will be used. The stock is placed into the drum with 200 gal. of water at 65° F. and 180 lb. of salt. Mill 5 minutes and then add 42 lb. sulphuric acid, 66° Bé., in 15 gal. of water, and mill 15 minutes, then add 45 gal. of chrome liquor.* This is added in three doses of 15 gal. each, 30 minutes apart. After the last addition of chrome liquor mill for 5 hours, let stand in drum overnight.

The following morning, mill the stock for 30 minutes, then add 15 lb. of bicarbonate of soda dissolved in 20 gal. of water at 75° F.

Add the soda at the rate of 1 gal. every 2 minutes. After the last addition mill the stock for 30 minutes, remove from drum and horse up for 24 hours, set and split. The split stock is divided into lots of 500 lb. each for coloring and fat liquoring.

* The chrome liquor for this tannage is made as follows:

Bichromate of Soda	1000 lb.
Sulphuric Acid, 66° Bé.	980 lb.
Corn Sugar	332 lb.
Total Volume	500 gal.

The usual precautions must be taken and the manner for procedure is the same as that for the chrome liquor under "One Bath Tannage" for glove horse.

Coloring

Place the stock into the drum with 150 gal. of water at 90° F., and add 3¾ lb. soda ash in 10 gal. of water. Mill for 30 minutes, then wash with water at 110° F. for 1 hour. Drain the drum and add:

Water at 120° F.	250	gal.
Direct Black in 30 gal. of Water at 120° F.	17½	lb.

Mill 30 minutes and drain the drum, add:

Water at 120° F.	250	gal.
Methyl Violet	2½	oz.
and		
Acetic Acid	4	oz.

in 20 gal. of water, mill 20 minutes. Drain drum.

Fat Liquoring

Prepare the following:

Logwood Crystals	7½	lb.
Water, Boil and Add	20	gal.
Fig Soap	15	lb.
Sod Oil	100	lb.
Sulphonated Cod Oil	10	lb.
Total Volume	50	gal.

Use steam jet agitator for the purpose of preparing the above emulsion, add to the drum at 150° F., and mill 1 hour. Remove from drum and horse up to drain for 16 to 24 hours, set out on Turner Serial Table Machine.

Oiling and Drying

Oil off the set out stock on the grain with a light paraffin oil, using a shearling swab for the purpose. Apply a light coat. Then send the stock to the dry room. Hang up the stock in a room equipped with fans and heating coils. A temperature of from 90 to 100° F. is maintained; the air is well circulated with fans so that drying is effected in 24 to 36 hours. The stock is then crusted for two days in a cool room.

Sammying and Staking

Dip the stock in warm water, 110° F., for 1 minute, place into a bin, cover with burlap and allow to mull for 4 hours, then place into damp sawdust containing 40% moisture, let rest for 24 hours. Then stake on a Slocum Machine equipped with a fiber pad on the staking head. Apply as much pressure as the stock will stand; cracking of the grain must be avoided. Then hang up the stock to air off at room temperature, restake and trim closely where necessary and again stake if hard spots are found.

Finishing

Use the following finish:

Shellac Solution	6	pt.
Casein Solution	8½	pt.
Liquefied Gelatin	6½	pt.
Carnauba Wax Emulsion	1½	pt.
Sulphonated Cod Oil	1	pt.
Nigrosine	1¼	lb.
Water	30	pt.
Ammonia	1	pt.

Mix the above ingredients in the order given, the Nigrosine first dissolved in the water. Apply two coats of the finish to the stock, allowing to dry well after each application. Finally polish on a shearling wheel.

In order to obtain the desired results it may be necessary to vary the quantities of some of the finish materials. A third coat of finish may also be required. Proper drying between coats is of importance.

The greatest factor affecting finishing of leather is the type and amount of fatliquor used. This holds particularly when a finish job at low cost is desired. In other words, the finish must be properly adjusted by varying its components until the proper balance is obtained.

Synthetic Tanning Process
U. S. Patent 1,975,616

The hides, skins or pelts are prepared by any suitable and well known process and then immersed in a solution containing approximately 20% of a urea-formaldehyde solution and 10% of salt at about 35° C. and gently agitated for about 5 hours. The temperature may then be raised to 45° C. and the solution acidified to about pH_3 with sulphuric acid and agitation continued for 30 minutes. The temperature is then raised to 55° C., the skins worked for 15 minutes, cooled, rinsed in cold water, neutralized with

sodium bicarbonate, rinsed, fat liquored and dried.

One method of producing the urea-formaldehyde solution mentioned in the above example is as follows: 3 oz. of urea, 1½ oz. formaldehyde, 2 oz. sodium carbonate and 16 oz. of sodium chloride are dissolved per gallon of water, and this solution employed in the tanning process at once, or at least prior to the formation of an insoluble precipitate.

Leather Oil

Spindle Oil	96 g.
Caoutchouc, Crude	3 g.
Resin, Coumarin, Viscous, Liquid	1 g.

Heat to 100° C. and stir until dissolved; add a little Birch Tar Oil (as perfume).

Sport Leather Oil

Pale Train Oil	50 g.
Degras	20 g.
Woolfat, Neutral	5 g.
Birch Tar Oil	5 g.
Spindle Oil, Refined	20 g.

Melt together and add:

Caoutchouc Solution (5–10%) in Toluol	2 g.

Oiling Leather with Petrolatum

Satisfactory penetration is obtained by drumming with a hot mixture of petrolatum 45, mineral oil 40, and degras 15%.

Special Leather Oil

Cold Test (20°) Neatsfoot Oil	50 gal.
Paraffin Oil (28°)	25 gal.
Water	25 gal.
Sulphonated Castor Oil (50%)	25 lb.

Manipulation: Mix water first with the sulphonated castor oil. Then mix all ingredients at 30° C.

Leather Fat, Black

Formula	No. 1	No. 2	No. 3	
Paraffin Wax	8	4	5.2	g.
Wool Fat, Raw	2	1	—	g.
Montan Wax, Crude	4	3	3.9	g.
Carnauba Wax, Gray	2	—	—	g.
Nigrosine, Fat-Soluble	1	0.3	0.39	g.
Train Oil	8	4	5.4	g.
Mineral Oil	60	28	32	g.

Leather Fat, Yellow

Formula	No. 1	No. 2	
Paraffin Wax	8.5	5	kg.
Beeswax, Yellow	1.5	—	kg.
Train Oil	7	4	kg.
Spindle Oil	45–48	27	kg.
Yellow 1435, Dye	10	10	kg.
Carnauba Wax	—	1	kg.
Wool Fat	—	0.3	kg.

No. 3

Paraffin Wax	8,000 g.
Carnauba Wax	1,375 g.
Wool Fat	340 g.
Train Oil	5,670 g.
Mineral Oil	35,000 g.
Yellow 1435, Dye	12 g.

No. 4

Paraffin	10,000 g.
Ceresin	9,000 g.
Carnauba Wax Arrears	1,000 g.
Train Oil	4,000 g.
Spindle Oil	70,–80,000 g.
Yellow 1435	20 g.

Leather Dressings or Finishes

Formula No. 1

Shellac	9 g.
Venetian Turpentine	1 g.
Castor Oil	1 g.
Alcohol	89 g.

Mix until dissolved and filter.

No. 2

Gum Mastic	12 g.
Gum Sandarac	5 g.
Castor Oil	2 g.
Alcohol	81 g.

No. 3

Orange Shellac	16 g.
Caustic Soda	0.9 g.
Boric Acid	1.2 g.
Sodium Ricinoleate	0.9 g.
Water	81 g.

No. 4

Orange Shellac	27 g.
Caustic Soda	2¼ g.
Boric Acid	2¼ g.
Sodium Ricinoleate	2¼ g.
Water	66¼ g.

No. 5

Shellac, Bleached	20 g.
Galipot Resin	½ g.
Borax	4 g.
Ammonium Hydroxide	½ g.
Turkey Red Oil	2 g.
Water	73 g.

Dressing for Hunting Leather
(Inflammable!)

a.	Nigrosine Base	10 g.
	Olein	30 cc.
b.	Benzol (90%)	150 cc.
	Alcohol	500 cc.
	Cleaning Benzoline	500 cc.

Auto Top and Artificial Leather Dressing

Nitrocellulose (Film Scrap)	40 g.
Camphor	10 g.
Ethylacetanilide	10 g.
Castor Oil	5 g.
Lampblack	5 g.
Nigrosine	2 g.
Alcohol	100 g.
Benzol	100 g.

Suede and Chamois Leather Dressing
U. S. Patent 2,015,943

Acetone	90 oz.
Chloroform	60 oz.
Liquid Petrolatum	140 oz.
Naphtha	870 oz.

Leather Finishes

A good *polish* is made from 22 g. stearin, 22 g. carnauba wax and 56 g. linseed oil. It is better to prepare an "emulsion polish" by mixing 22 g. stearin, 22 g. carnauba, 11 g. paraffin, 23 g. linseed oil, 3 g. ammonium chloride and 17 g. water. The carnauba wax may be replaced by synthetic waxes. *Waterproof spirit finishes* are made by mixing shellac (9 g.), Venetian turpentine (1 g.), castor oil (1 g.), and 96% alcohol (89 g.); or mastic (12 g.), sandarac (5 g.), castor oil (2 g.), and spirit (81 g.). All grease should be removed from the leather before application of spirit finishes. For making *polishes* of good elasticity a recipe recommended is: ruby shellac (16 g.), technical caustic potash (0.9 g.), boric acid (1.2 g.), castor oil soap (0.9 g.), water (81 g.). Camphor oil may be added as a perfume. For treating leather of more porous nature, colloidal matter such as carragheen moss, algin, etc., are added to the above soap finishes, or gum tragacanth may be used. A recipe for *green bronze finish* is magenta 7.6 g., safranine 1.9 g., ruby shellac 1.4 g., and methanol 89.1 g.

Fur Glazing

Dissolve 3 to 6 oz. of paraffin wax in 1 gal. petroleum cleaning solvent.

Approved cleaning solvent is preferable because of its safety during ordinary handling.

Precaution: Paraffin separates from the petroleum solvent at temperatures below 70° F. At —15° F. it is completely chilled out of the solvent.

This finish is used for the saturation of dry cleaned furs to replace any oils removed and to make them water repellent. It is also sponged or sprayed on materials that are lifeless or lusterless after cleaning and drying to produce high gloss.

Natural Color and Glaze for Snakeskins

An alum tannage is good for pocketbook leather and will as a rule impart a natural color. For each 100 lb. of bated and drained skins use 7 lb. alum, 2 lb. salt, 8 lb. flour and 5 lb. liquid egg yolk. The alum and salt are first dissolved in a small quantity of hot water and the solution then cooled. After cooling, the solution is added to the flour with constant stirring. Dissolve the egg yolk separately in a small quantity of cool water and then add to the other ingredients. This mixture when ready to apply should weigh about the same as the skins, that is, it should measure about 10 gal. for every 100 lb. of skins.

Stir the skins in this mixture for about 3 hours, or until nearly all of it is absorbed by the skins. Leave the skins in the same container or vat overnight. Then strike them out, stretch moderately on boards and dry. After drying, take the skins off the boards and wash them with a brush in cool water. This washing will remove any dried mixture remaining on the grain side.

Next lay the skins in piles overnight with grain to grain and cover with a moist cloth. Then stake and dry. After drying give the skins another staking. Some tanners also fluff the flesh side.

A good mixture for glazing can be made from the following: 1 oz. egg albumen, 1/10 oz. gelatin, 2 oz. milk and 5 pt. water. The egg albumen is dissolved in 4 pt. of the water at 90–95° F. and the gelatin dissolved in 1 pt. of hot water and then allowed to cool to 90–95° F. The two solutions are mixed and then the milk is added.

This mixture is brushed on the grain side. The skins are then dried again and glazed by machine. Some tanners repeat this application and add a small quantity of casein or shellac. Others use castor oil and methylic alcohol.

Dressing Bagdad Leather

Skins known commercially as Bagdads differ considerably in weight, size and quality, but they are all usually heavily loaded with dirt and loose tanning matters, all of which require to be completely removed before the goods can be properly dressed. After sorting, trimming and perhaps necking on the shaving machine, the goods need drumming for half an hour in a solution made up of 10% salt and ½% sulphuric acid on the dry weight. Some tanners use a cold solution, but a temperature of 100° F. will be found advisable for complete action. The object of processing the goods in the above liquor is to cleanse and open the pores of the leather so that it will be able to absorb the tannins during the next stage of dressing. At the end of the allotted time, namely half an hour, the liquor should be run off and the goods washed up in running water, preferably warm, for three-quarters of an hour. If the Bagdads are in a filthy condition the percentage of sulphuric acid should be increased to 1%, and this will generally prove strong enough to clear the grain and remove any stains, particularly iron marks. These preliminary processes are very important, especially in the case of whites, where it is of the utmost importance that the leather should be as clean as possible before the bleaching or whitening process commences.

Re-tanning

This operation can be successfully carried out in the drum, and, indeed, this is really the most suitable receptacle. A good synthetic tanning material, such as Maxyntan or Sellatan, in conjunction with sumac extract, usually forms the basis for a white tannage, and it is not advisable to use any tannin likely to darken the color of the leather. A run for half an hour in 5% of the synthetic followed by half an hour in 5% sumac extract will be found eminently satisfactory, but if it is necessary to reduce expenses to a minimum, the synthetic can be increased and less sumac extract employed. The tannage gives a very clean and fairly soft leather which will feed up well. The amount of water used depends a great deal on the weight and size of the goods, but in all cases the minimum should be run in, as this will ensure better exhaustion of the liquor.

After re-tanning for one hour, the goods should be taken out of the drum and horsed up overnight. Whilst this is not absolutely necessary, it is always advisable if time and labor charges will permit, as it enables the tan to fix and the fibers to feed. Practical experiments have shown that there is a recognizable difference in the handle of leather allowed to drain for 12 hours as compared with leather rushed through the processes.

Bleaching

Next day, run the goods in the following solution: 2½% barium chloride and just sufficient warm water, 100° F., to cover the leather.

A run of a quarter of an hour will enable the leather to take up the barium salt and exhaust the solution. An addition of sodium sulphate, 5%, dissolved in a small volume of warm water will precipitate barium sulphate, a white insoluble salt, in the fibers of the leather. This bleaching process is quite economical and if worked properly it will be found to give a very clean, white leather.

Some tanners use sulphuric acid instead of the sodium salt, but sodium sulphate is equally satisfactory and with it there is less chance of the leather being rendered hard and brittle.

Whitening and Filling

To fill out the leather, improve its handle and general appearance, it is advisable to work the goods in the following mixture, which should be added to the drum through the hollow axle:

Devolite Clay	15 lb.
Flour	15 lb.
Soap	5 lb.
French Chalk	5 lb.
Turkey Red Oil	2½ lb.
Trace of Methyl Violet.	

A run of three-quarters of an hour in this liquor will complete the operation and afterwards the goods should be horsed up for a few hours preparatory to striking out and straining. The former process must be well done in order to remove all the wrinkles and drawn grain. To retain the fullness and suppleness of a well-nourished leather, the latter should be dried out in a moderate temperature. It is a bad practice to dry the leather in a fierce temperature for the sake of a few hours, but if this is imperative, then the temperature should be increased gradually. When dry, the leather requires buffing, then chalking on the grain and flesh, and finally boarding.

Semi-chrome Colors

A better quality skin is uusally chosen for this work, and naturally the tanner has a better chance of producing a full and nice feeling leather. Goods should be

washed in warm water for half an hour to remove loose dirt, and then stripped in a weak alkaline bath made up with 1 to 2% borax calculated on the dry weight of the leather. The stripping should take about an hour, and by this time practically all the loose tannin will be removed. The alkaline liquor should then be run off and the goods thoroughly washed in running water for half an hour.

Re-tanning in a Chrome Bath

After draining, the washed leather should be drummed with its own weight of a 4% salt solution for 10 minutes and the chrome liquor added. Prepare the chrome liquor by adding soda crystals to reduce the basicity. When using panchrome, 1 lb. of soda crystals for every 8 lb. of chromium salt is recommended. The latter should be dissolved in a known volume of hot water, and the soda dissolved in a small amount of hot water. The alkali must be added very slowly and the liquor stirred constantly during the addition.

The amount recommended for retanning Bagdads is 7% chromium salt on the dry weight of the leather. The chrome liquor should be passed into the drum through the hollow axle in three parts, at intervals of half an hour. A period of 2½ to 3 hours is recommended for complete re-tannage. The addition of 1% ordinary washing soda is then made, and drumming continued for a further hour. At the end of that time, the leather should be well tanned, and it is advisable to horse up for twelve hours or so. The next morning, the goods will need neutralizing, and 1% borax on the dry weight is recommended; a period of three-quarters of an hour will be found to be sufficient to neutralize the leather.

A light mordanting is recommended to ensure more level dyeing, and to give the leather a better feel or handle. Gambier is quite good, so also is Osage Orange Extract; about 2% on the dry weight will be found ample. Acid dyes should be used and there is, of course, an unlimited number of colors available.

After dyeing, the leather should be well fat liquored, and the following recipe is excellent for semi-chrome clothing leathers. Dissolve ½ oz. of potassium carbonate in a small quantity of hot water, 180° F., and then add 2 lb. of neatsfoot oil and ½ lb. of potash soap. Emulsify the mixture and then add 1 lb. of heavy sulphonated oil and ½ lb. of mineral oil and stir vigorously until the emulsion is stable. Use 4 lb. of this fatty mixture for every 100 lb. of dry leather. After fat liquoring, the goods should be horsed up for several hours prior to striking out and drying. The drying should be carried out in a moderately warm, but not hot shed, and it is not advisable to have the goods strained, as it is likely to render the leather hard and impoverished.

When dry, the leather should be stored in damp sawdust for 12 hours or until in the right condition for staking. After staking and drying it requires fluffing on an emery wheel and finally dope finishing in the usual way.

Belt Dressing

Formula No. 1

Wool Fat	50 g.
Mineral Oil (0.885–90)	20 g.
Paraffin Wax (56–58° C.)	10 g.
Ceresin, Yellow (58–60°)	5 g.
Castor Oil ("Second Pressing")	10 g.
Degras	5 g.

No. 2

Resin	40 g.
Train Oil	10 g.
Cotton Seed Oil or Sperm Oil, Blown	15 g.
Paraffin Scale Wax (48–52° C.)	15 g.
Mineral Oil (sp. gr. 0.905)	20 g.

No. 3

a.	Wool Fat, Neutral	30 g.
	Tallow	20 g.
b.	Graphite, Amorphous	10 g.
	Castor Oil	10 g.

Melt up the fats *a*, stir then into the fusion graphite, and castor oil. Press. The product is soft and like a salve.

Shoe Bottom Dressing

Montan Wax, Bleached	10 oz.
Paraffin (or Scales), White (50–52° C.)	10 oz.
Anilin Dyestuff (Oil Soluble)	2 oz.
Turpentine Oil (or Substitute)	54 oz.

Patent Leather Dressing

Black

Formula No. 1

Celluloid	20 lb.
Castor Oil	5 lb.
Lampblack	5 lb.
Alcohol	30 lb.
Benzine	35 lb.

No. 2

Celluloid	25 lb.
Lampblack	8 lb.
Nigrosine	1 lb.
Castor Oil	6 lb.
Alcohol	20 lb.
Benzine	45 lb.

No. 3

Celluloid	25 lb.
Lampblack	8 lb.
Nigrosine	1 lb.
Castor Oil	8 lb.
Alcohol	25 lb.
Benzine	40 lb.

Red

Celluloid	30 lb.
Ochre	5 lb.
Castor Oil	5 lb.
Zinc White	3 lb.
Nigrosine	2 lb.
Alcohol	20 lb.
Benzine	30 lb.

Blue

Celluloid	30 lb.
Zinc White	5 lb.
Paris Blue	2 lb.
Castor Oil	8 lb.
Alcohol	25 lb.
Benzine	25 lb.

Green

Celluloid	30 lb.
Zinc White	5 lb.
Schweinfurth Green	2 lb.
Castor Oil	8 lb.
Alcohol	25 lb.
Benzine	25 lb.

White Shoe Bottom Finish

Gum Tragacanth	2 oz.
Water	1¼ gal.

Soak and stir until smooth, then add

Precipitated Calcium Carbonate	2 lb.
Titanium Dioxide	¼ lb.
Oxalic Acid	1 lb.
Copper Sulphate	1 lb.
Magnesium Sulphate	5 lb.
Sal Soda	3 oz.
Water	6 gal.

Black Dye for Leather

The following dye solution is used for the dyeing of the uppers of leather shoes. It will render same black in one application regardless of the previous color.

Black Dye (Alcohol Soluble)	4 oz.
Methanol	66 oz.
Benzol	20 oz.
Nitrobenzol	10 oz.

The black dye should be of the acid type such as Calco Condensation Black No. 1601. The solvents are mixed and the dyestuff placed in a cloth sack and suspended in the solvent mixture which is occasionally agitated.

Shoe Luster (Finish)

Water	850 cc.
Ammonia (0.910)	20 cc.
Shellac, Bleached, Finely Powdered	150 g.

Let stand cold for some hours; heat the jelly formed to liquefy it.

High Luster Finish

a.	Water	100 cc.
	Borax	25 g.
	Shellac, Bleached	150 g.
b.	Water	700 cc.
c.	Turkey Red Oil	50 cc.

Dissolve *a*, warming up gently without boiling; thin with *b*, and add *c*.

Dark High Luster Finish

Ruby Shellac, Powder	150 g.
Water, Cold	850 cc.
Ammonia (0.910)	20 cc.

Soak for 6–8 hours (covered), warm to complete solution (if necessary, add more ammonia). Optional: add dyestuff.

High Luster Finish

a.	Ruby Shellac	150 g.
	Water	200 cc.
	Ammonia (0.910)	30 cc.
b.	Water	550 cc.

Make up *a*, thin with *b*.

Liquid Burnishing Wax for Shoe Soles

Carnauba Wax	20 oz.
Turpentine	20 oz.
Black Dye (Oil Soluble)	3 oz.
Duponol W.E. or Lohrinol	5 oz.
Ferric Acetate	6 oz.
Glacial Acetic Acid	0.2 oz.
Water	45.8 oz.

Reduce the ferric acetate to a powder and dissolve same in the acetic acid and water mixture. Dissolve the Duponol W. E. in the above solution and heat to about 170° F. Melt the carnauba wax and pour into the turpentine which has been previously heated to about 180° F., dissolve the black dye in this mixture, and then add this latter solution to the former while agitating vigorously. Allow to cool with continued agitation. Du-

ponol W. E. is one of a series of soaps or emulsifying agents of the higher alcohol sulphates which are effective as such in an acid solution.

Preserving Hides and Skins
German Patent 617,166

Salt	99 lb.
Sodium Perborate	1 lb.

Conservation of Shoe Soles

Melt up:

Linseed Oil	50–60 g.
Paraffin	40–50 g.

Heat 80° C.

Treat soles with this mixture after thorough cleaning, 2 or 3 times in 4–6 weeks.

Hardener for Shoe Soles

Rosin, Pale	4 g.
Linseed Oil Varnish	5 g.

Dissolve hot and add:

Benzoline or Turpentine or Mixture	9 g.

Impregnation of Shoe Soles
French Patent 750,728

a.	Benzoic Acid	3 g.
	Acetone	40 cc.
	Alcohol	10 cc.
b.	Oxalic Acid	3 g.
	Aluminum Sulphate	5 g.
	Water	50 cc.

Dissolve *a* and *b* separately, mix, add 15 g. of dye to 1 liter; brush on roughened soles.

Preservation and Hardening of Sole Leather

Linseed Oil	6 cc.
Water Glass (40–45° Bé.)	4 cc.

Mix until emulsified. Apply with brush.

Waterproofing Leather
Formula No. 1

Gutta-Percha	2 g.
Rape Seed Oil, Boiled	8 g.
Yellow Wax	6 g.
Pig Fat	25 g.
Venetian Turpentine	60 g.
Spermaceti	1 g.

No. 2

Linseed Oil	100 g.
Gutta-Percha	10 g.
Copal Varnish	a little

No. 3

Amber	380 g.
Linseed Oil, Boiled	250 g.
Sandarac	30 g.
Turpentine, Venice	60 g.
Turpentine	200 g.
Tallow	600 g.
Caoutchouc	75 g.
Linseed Oil	300 g.

No. 4
For Hunting Shoes

Caoutchouc	4 g.
Pig Fat	6 g.
Cod Liver Oil	24 g.

No. 5
For Horse Covers

Japanese Train Oil	94 g.
Saturated Caoutchouc Solution in Turpentine	5 g.
Aniline	1.5 g.

Quick Black Shoe Edge Ink

Bright Drying Carnauba Wax Emulsion	50 lb.
Nigrosine	8 lb.
Water	3 gal.

Edge Filler for Shoe Factory Use

Soap	15 lb.
Yellow Dextrin	5½ lb.
Neatsfoot Oil	1½ qt.
Oil of Mirbane	1 pt.
Gelatin	11½ lb.
Formaldehyde	1 qt.
Water	1 qt.

This is made up with sufficient water to make 60 gal. solution.

Brown Shoe Heel Stain

Alcohol	7 fl. oz.
Acetone	1 fl. oz.
Gum Tragacanth	4 oz.

Mix the above until gum is thoroughly wetted and to it add slowly with stirring the following solution made by boiling and then cooling:

Oxalic Acid	3 oz.
Water Soluble Brown Dye	8 oz.
Water	2¼ gal.

Strain through cheesecloth.

Shoe Dye Remover

Isopropyl Alcohol	7 cc.
Acetone	1 cc.
Butyl Cellosolve	1 cc.
Water	10 cc.

Shoe Repairing Cement
U. S. Patent 2,004,059

Six pounds crepe rubber, 2.5 lb. rosin, and 1.5 lb. zinc dimethyl dithio carbamate, said components fluidified in 15 gal. of benzol.

Fat Liquor, Leather

Lecithin	50 lb.
Water	50 lb.
Soda Ash	½–1 lb.

Mix the above well and then mix in a suitable quantity of neatsfoot oil.

Russia Leather from Rejected Hides

The washed and pressed leather is greased in a drum with a mixture of 2 kg. train oil, 5 kg. mineral oil and 4 kg. degras per 62–5 sq. m. of hides, drummed 40 minutes while warm, spread, stoned, dried for 4–5 hours to 38–40% water content and cut through the middle into halves. The damaged spots are cut out, the hides reset and greased by hand on both sides with a mixture of degras 2 kg., train oil 6 kg., mineral oil 6 kg., lard 6 kg. and tar 5 kg. per 100 sq. m. The leather is left for 12 hours and dried at 28–30° C. to a water content of 32–5%, left for 6 hours to assure a uniform distribution of the water and finally worked over with the whitening sleeker. The leather is then dyed, greased on both sides with a mixture of 3 kg. train oil, 4 kg. tar, 6 kg. mineral oil and 2 kg. paraffin, allowed to rest 12 hours, dried at 28–30° C. and treated with a mixture of 150 g. nigrosine, 125 g. gum tragacanth, 50 g. carpenter's glue, 1.5 liter blood and 1 liter milk (all mixed with 12 liters water). The goods are finally dried, polished and sorted.

Preserving Lizard Skin

Skins are treated with

Zinc Chloride	2 lb.
Salt	10–20 lb.
Water	100 lb.

Protection of Hides and Skins from Skin Beetle

Salt thoroughly applied to hides gives excellent protection against beetle attack. Heavily salted hides which are first rubbed with salt and then soaked in saturated brine for 10 hours or are merely soaked in the brine, are entirely protected during storage for 6 months in the summer in a beetle-infested room. Hides which are rubbed on the flesh side are not so well protected. Hides are protected almost completely by dipping them, immediately after flaying, in a 2.5% sodium arsenite solution. Spraying sun dried hides on the inside with the sodium arsenite solution does not altogether protect the grain, although it does so to some extent. Sodium arsenite has a marked preservative action on the hides, but a solution stronger than 2.5% is required to prevent decay when hides are dried in the shade in humid regions. When they are stored with salted and untreated hides, the sodium arsenite treated hides do not act as a bait for the beetles and no dead insects are found on them. The sodium arsenite treatment has no deleterious effect on the leather prepared from the hides, and the workmen who handle the hides show no signs of arsenical poisoning.

Stuffing for Welting Leather

Cod Oil	1 gal.
Sulphonated Cod Oil	1 gal.

The above mixture is used per 100 lb. of welting.

Tanning Shearlings

Soaking: Skins are soaked in clean water, salted skins 10 to 24 hours; dry skins several days, according to condition. Skins must be thoroughly soaked but care must be taken that the wool does not become loose. To prevent this different ingredients are added to the soaks. Small quantities of any of the following may be used: zinc chloride; formaldehyde or alum.

Naphtha or degrading compounds are the most efficient for removing the excess grease; these being reclaimed by distillation and the grease is recovered as a by-product. In case the stock is not degraded it should be thoroughly washed with a warm soap and soda solution. After degreasing all burrs and brands are worked out. Neglecting to clean out burrs will cause damage in the unhairing machine. Skins are then washed by hand to remove all dirt and to render them as white as possible. This step in the process may be accomplished in the paddle or drum which has a tendency to loosen the wool.

The pickling or tanning may be carried on in the paddle or by hand. If the paddle is used a base solution of approximately 1 lb. of salt for each gallon of water is used and then built up to the desired salometer with equal parts of salt and alum. This amount should be about 4% of each on the weight of stock. This solution may be used several times by the addition of equal parts of salt and alum figured on the weight of the stock.

A small amount of sulphuric acid may be used if desired. This bath is worked up to 50 or 60° C. over a period of 3 days. When stock is struck through it is taken out and drained and is ready for oiling or may be retanned with gambier or quebracho. White and light shade stock is finished out of the alum.

Skins tanned by hand are best treated on the flesh with salt and sulphuric acid solution. This solution is made with 1 lb. of salt and 1½ oz. of acid to each gallon of water. This solution is applied to the flesh with a brush and the skins piled flesh to flesh or folded down the back with the flesh side in. The next morning the stock is given an alum tan on the flesh made up as folows:

Alum	5%
Salt	5%
Sodium Bicarbonate	5%
Flour	5%
Egg Yolk	1%
Oil	1%

The flour should be worked into a paste, after which the other ingredients are added, the egg yolk being dissolved in a small quantity of cold water. Soda should be added slowly. Two coats of this mixture are given at intervals of 10 to 12 hours at which time stock should be thoroughly tanned. Stock is now thoroughly dried out after which it is sammied back, staked and a light coat of oil given the flesh or a fat liquor may be given, made up of soap, neatsfoot oil and sulphonated oil. Stock before becoming thoroughly dried is staked and stretched. After skins are dried they are restaked, snuffed, combed and clipped. If desired stock can then be dyed or bleached.

Russia Leather Odor

Bases for this odor are:

2-Tertbutyl 4,5 dimethyl-1-phenol.
or
2-Isopropyl-4,5-dimethyl-1-phenol.

Gear Lubricant for Arctic Climates

In the northwestern section of the United States and a large section of Canada air temperatures of 40° below zero are not uncommon. At temperatures such as these ordinary winter gear oils are too viscous to permit satisfactory operation of motor cars, and many motor car manufacturers have recommended diluting the gear oil with kerosene to meet these conditions. This practice has always been frowned upon by lubrication engineers since even if the lubricating value of the oil is not entirely destroyed by such dilution, the facilities of the average service station for accurately blending without danger of contamination are not the best. The following formula will produce a lubricant which will give satisfactory performance and adequate lubrication under arctic weather conditions.

Thickened Rape Oil	8 lb.
Asphaltic Black Oil (90 visc. at 210° F.)	7 lb.
Gulf Coast Pale Oil (100 visc. at 100° F.)	85 lb.

Sulphur Lubricant Base

The use of sulphur for manufacturing lubricants of high film strength is rapidly gaining popularity. The formula given here will produce a base which can be diluted with mineral oils to make cutting oil and various extreme pressure compounds.

Flowers of Sulphur	10 lb.
Lard Oil	90 lb.

Mix well and slowly raise the temperature to 425° F. Maintain mild agitation throughout.

Anti-Rust Compound

Rust and corrosion will do more damage to machinery than several months of hard service. This is particularly true of construction and railway machines which must often be left exposed for long periods. A simple formula for an efficient and economical protective compound is given. The materials should be heated, mixed well and applied with an old paint brush.

Paraffin Wax	6 lb.
Asphaltic Still Residue (About 1000 visc. at 210° F.)	94 lb.

Steering Gear Lubricant

With the general trend to wider treads on automobile tires it has been necessary to redesign steering gear mechanisms to avoid hard steering. Automobile engineers agree that special lubricants are required for most efficient operation.

Oleic Acid	300 lb.
Lime	43 lb.
Water	16 gal.
Western Cylinder Oil	475 gal.
Sulphur Base	1000 lb.

Proceed the same as for making lime soap grease except that the sulphur base is not added until the other ingredients are completely cooked.

Mixed Base Grease

The following formula will make a grease which combines the advantages of the smooth texture of calcium soap grease with the cohesive rubber-like character of aluminum oleate. Although the melting point of this grease is not materially higher than a similar calcium soap grease, the melted grease has the slow flowing characteristics of aluminum greases. The formula given is for a medium consistency but other grades can be made by varying the soap content.

Lime	17 lb.
Fat	113 lb.
Aluminum Oleate (Pulp Stock)	50 lb.
Pale Oil (100 Viscosity)	112 gal.
Water	6 gal.

Place the fat in a steam jacketed kettle equipped with paddles for stirring, add a small portion of the mineral oil, mix the lime with sufficient water to form a thin paste and add this to the material in the kettle. Turn on the steam and start the paddles. When the soap has cooked for 5 hours it should be tested to determine if saponification is completed, if so the steam is turned off and half of the balance of the mineral oil is run in slowly. The rest of the mineral oil is run into a separate kettle and the aluminum oleate melted in it and this mixture is pumped into the first kettle while still warm. Stirring should be continued until a smooth uniform grease is produced.

Non-Bleeding Grease

One of the difficulties encountered in the use of pressure grease is the tendency of the light oil to separate and bleed away leaving the bearing choked with a hard soap. This formula produces a grease which will stand indefinitely without separating. This is not a high melting point grease and is intended for automobile chassis lubrication and similar applications.

Green Petrolatum	250 lb.
Paraffin Pale Oil (28° Bé.)	92 gal.
Lime	9 lb.
Fat	55 lb.
Water	3 gal.

Melt the petrolatum in the mineral oil. Mix well, then proceed as for ordinary calcium soap grease.

Lubricant for Bearings with High Temperatures and Pressure

Formula No. 1

Rosin	7 g.
Wool Fat Stearin	3 g.
Mineral Oil (0.900–7)	80 g.
Castile Soap	15 g.
Caustic Soda (40° Bé.)	4 g.

No. 2

Rosin	5.5 g.
Wool Fat, Crude	6 g.
Wool Fat, Stearin	11 g.
Tallow	5 g.
Linseed Oil	5 g.
Caustic Soda (35° Bé.)	5 g.
Mineral Oil (0.885–90)	78 g.

No. 1 is a high melting fat (150–200° C.), No. 2 melts at about 100° C.

The saponification is done in a directly heated kettle (cast iron), which has a removable stirrer, at 150–200° C. Test: should not sweat oil or alkali when pressed with the finger after cooling. If desired, *short-cut fibers* may be added to the mass. Solidify in patterns and cut into briquets.

Metal Rolling Lubricant

Tallow	60 lb.
Yellow Soap	15 lb.
Water	92 gal.

Heat and stir until smooth.

Non-Greasy Lubricant

U. S. Patent 1,970,902

Sodium Alginate	19 oz.
Water	100 oz.

Mix to a smooth paste while heating to 100° C. Add

Glycerin	76 oz.

Boil off nearly all of the water.

Olive Oil Motor Lubricant

Olive Oil (Low Titre)	25 fl. oz.
Mineral Oil	75 fl. oz.

Lubricating Grease for Carriages

Blue Oil	45 g.
Slaked Lime	6 g.
Rosin Oil	22.5 g.
Fat Soluble Black Dye	0.2 g.

Dissolve in the blue oil.

Chain Lubricant

Formula No. 1

Stearin	85 g.
Beeswax	5 g.
Carnauba Wax	5 g.
Japan Wax	5 g.

No. 2

Stearin	85 g.
Beeswax	2.5 g.
Carnauba Wax	5 g.
Japan Wax	5 g.

Pour at lowest possible temperature and allow to cool slowly and undisturbed.

Penetrating Oil

British Patent 414,847

Useful for loosening rusted metal parts.

Engine Oil	1 qt.
Naphtha or Kerosene	3 qt.
Carbon Disulphide	2 oz.
Oil of Camphor	1–2 oz.
Graphite, Powder	1–4 oz.

Core Oil

Formula No. 1

Linseed Oil	300 oz.
American Gas Oil	600 oz.
Dark Whale Train Oil	100 oz.

No. 2

Rosin	200 oz.
Train Oil	200 oz.
Vulcan Oil	600 oz.

Stuffing Grease

(Melting Point over 96° C.)

a.	Tallow	12 g.
	Lard Oil	3 g.
b.	Lime Hydrate	2.5 g.
c.	Zinc Oxide	2.5 g.

d. Machine Oil, Refined 4–5° E. Viscosity 50° C. 79 g.
e. Yellow Aniline Dye, Oil Soluble 0.03 g.
f. Water 1 g.

Notes: *Lime Hydrate*—Made up of finest commercial lime hydrate, diluting with water 1:4.

Work bringing *a* into kettle with ⅓ to ½ of needed *d*; heat to 80–90° C., add slowly *b*, continue warming. At 100° C. the mass starts "rising" in the kettle, then diminishes when water is evaporating.

Tests: Should be resistant against not too strong finger-pressure; weakly brittle, should not sweat out water or oil when cooled. On the other hand, a water insufficiency is indicated if mass is too brittle (in this case add little boiling water). If tests are satisfactory, add the remainder of *d*, at 70° C. or warmer —not too slowly, not too quickly. The aniline dye dissolve in mineral oil.

Let stand over night. Stir till cool next day.

Cutting Oil

Formula No. 1

a. Mineral Oil (Spindle Oil)	80	g.
"Tall-Oil," Refined	20	g.
b. Caustic Potash (40° Bé.)	6	g.
c. Methylhexalin	1–2	g.

Saponify *a* with *b*, clear with *c*.

No. 2

Paraffin Oil (28 to 30° Bé.)	250	g.
Rosin	22	g.
Oleic Acid	22	g.
Caustic Soda	3	g.
Water	10	g.
Alcohol	7	g.

No. 3

Lard Oil (No. 1)	1	gal.
Paraffin Oil (28° Bé.)	52	gal.

Manipulation: Mix at room temperature.

No. 4

Lard Oil (No. 1)	5	gal.
Extra Lard Oil	5	gal.
Paraffin Oil (28° Bé.)	42	gal.

Manipulation: Mix at room temperature.

Non-Corrosive Cutting Oil

U. S. Patent 1,979,250

Mineral Oil	71–74	lb.
Castor Oil	8¼–9½	lb.
Rapeseed Oil	8¼–9½	lb.
Caustic Potash	8¼–9½	lb.
Soda Ash	0.6–1¼	lb.

Mix and dilute with water.

Brake Oil (Non-Rancid)

a. Mineral Oil (Spindle Oil)	1000	g.
b. Paratoluol Sulphochloride	5–6	g.

or

a. Rape Seed Oil	900	g.
a. Camphor Oil	100	g.
b. Paratoluol Sulphochloride	5–6	g.

Dissolve *b* in little part of *a*, then add to the above amount.

Gasoline Motor Lubricant

British Patent 423,441

Mineral Oil	99	lb.
Chromium Oleate	1	lb.

Radiator Anti-Rust Compound

In the past year the automotive industry has given much attention to the prevention of rust and corrosion in automobile cooling systems. Engines with aluminum composition cylinder heads have received the most attention but even in the case of ordinary steel parts it has been found that cooling systems are more efficient if rust and scale formation is prevented.

For this purpose soluble cutting oil such as is used for machining metal is very efficient. The only limiting factors are acidity and alkalinity. Soluble oils having a high acidity will corrode the radiator while too much free alkali will damage aluminum cylinder heads. Several of the formulæ given in volumes one and two of THE CHEMICAL FORMULARY will be very satisfactory as cooling system corrosion preventatives. The usual quantity used is ½ oz. of soluble oil for each gallon of water.

Greaseless Lubricating Pencil

Useful for lubricating hinges of automobile doors, etc., as it will not run off and produce stains or accumulate dust.

Beeswax	80	g.
Diglycol Stearate	20	g.
Graphite Powder	100–200	g.

Melt together and stir until just cold enough to pour. Pour into molds and allow to set.

Dynamo Brush Lubricant

Ceresin	20	g.
Tallow, Acid Free	10	g.
Wool Fat, Neutral	10	g.
Castor Oil	10	g.
Vaseline Oil	50	g.

Melt together and add enough organic solvent (Heavy Benzoline, Naphtha or Tetralin).

Cotton Spindle Machine Oil

Spindle Oil, Refined (5–6° E at 20° C.)	85 gal.
Rape Seed Oil	15 gal.

Veneer Press Caul Lubricant
German Patent 596,345

Neutral Soap	15 oz.
Lanolin	35 oz.
Petrolatum, Liquid	30 oz.
Formaldehyde	16 oz.

Transformer Oil
U. S. Patent 1,988,299

Crude Mineral Oil	99.5 g.
Phenyl Alpha Naphthylamine	0.5 g.

Transformer Oil
Canadian Patent 353,332

To a mineral oil of iodine value of 7 to 20 about 0.5% phenyl α-naphthylamine is added to retard sludge formation.

Petroleum Proof Valve Lubricant

Citric Acid, Anhydrous	64 g.
Tetraethylene Glycol	97 g.

Heat at 180–185° C. for 90 minutes; cool. Do not overheat or an infusible product will form.

Rubber Mold Lubricant

Cocoa soapstock, a material containing a large percentage of coconut oil saponified with alkalies to give a pure hard soap, makes a suitable product for lubricating molds to prevent sticking of the vulcanized stock. If properly made, without traces of sodium silicate, it will not cause caking on the molds. The recommended quantity is 8 to 12 lb. to a 55 gal. drum of water. The soap is dissolved in water by cooking, either by open steam or external heat of some kind. For easy spraying the solution is kept warm by steam or a small electric heating unit can be applied at the spray nozzle to prevent clogging.

Screw Thread Lubricant

Flaked graphite mixed with a medium grade of lubricating oil to form a paste and applied to the threads of screws and bolts facilitates the backing off of nuts and the removal of screws and machine bolts. The paste, which also is suitable for pipe joints, prevents rust.

Vacuum Tap Grease

Rubber	30 oz.
Rosin	15 oz.
Pine Pitch	50 oz.
Soot	5 oz.

Journal Grease
U. S. Patent 1,989,196

Heavy Black Petroleum Oil	5.9 lb.
Heavy Steam Refined Petroleum Oil	34.4 lb.
Stearic Acid	40.5 lb.
Caustic Soda (48° Bé.)	13.1 lb.
Lard Oil	6.1 lb.

Spring-Leaf Lubricant
British Patent 414,948

White Lead in Linseed Oil (92 Lead, 8 Oil)	83–84 lb.
Graphite Powder	5.2 lb.
Petroleum Grease	10.4–10.5 lb.
Glycerin	0–1.3 lb.

Nickel and Monel Drawing Lubricant

A paste made of castor oil and lead, recommended for use as a lubricant in the cold forming of Monel metal and nickel, can be removed by a number of solvents. Carbon tetrachloride, being non-inflammable, is to be preferred. Benzene, gasoline, and alcohol produce satisfactory results.

Cold soap and caustic solutions are not entirely satisfactory but can be used as an alternative, if necessary, when they are used hot.

Wire Drawing Lubricant
U. S. Patent 1,944,273

Sodium Alginate	1 lb.
Tallow	4 lb.
Soap	2 lb.
Water	195 lb.

Drawing Die Lubricant for Diamond Dies

Rye Flour	6 lb.
Water	100 lb.
Beef Tallow	2½ lb.
Soft Soap	2½ lb.

Heat and stir until uniform.

Corrosion Protecting Grease

Neutral Petroleum Grease	100 oz.
Zinc Chromate Powder	2½ oz.
Pyridin Bases (Crude)	1 oz.

Rub together to form smooth grease.

Lubricant for Preventing Corrosion
French Patent 778,792

Sodium Peroxide	¼	oz.
Methanol	2	oz.
Hydrogenated Phenol	4	oz.
Lubricating Oil	100	oz.

Lubricating Haulage Ropes

Before the lubricant is applied, the surface of the rope should be cleaned and dried, because oil or grease applied to the surface of a rope covered with mud or coal dust, water and old oil will be thrown off without having the slightest chance of penetrating to the interior. In most cases the treatment can be given to the rope during an idle shift.

Main ropes used on inclines can be treated as follows: The rope should be wound very slowly on to the drum, the surface being cleaned as it enters the engine house. Cleaning should be done with wire brushes without using a solvent, such as petrol or paraffin. The brushes may from time to time be washed in paraffin, but this should be shaken off before using the brush on the rope again. The cleaning may be completed with waste or sacking. No solvent (petrol or paraffin) should be used on the rope, because experience has shown that the solvent readily penetrates into the middle of the rope and rapidly dissolves out any remaining lubricant. The rope should be allowed to remain on the drum long enough to allow it to dry as much as possible.

When the rope has been cleaned and dried, the lubricant should be applied by hand with a fairly stiff brush. Devices in which the rope is caused to pass under a roller in a bath of oil are less effective and are wasteful. It is important that the rope should be dry when the lubricant is applied otherwise the oil will not adhere, and the work should be done within the engine house as the rope leaves the drum. If the lubricant is applied in the open, a shower of rain may render useless the whole operation of cleaning and drying the rope. The successful lubrication of a haulage rope calls for a good deal of skill and patience, but unless it is properly done the time and materials are wasted. It is better to do a portion of the rope well each week than to waste a lot of grease by applying it to the whole of the rope without cleaning and drying.

It is not possible to lay down any fixed periods for the lubrication of haulage ropes, because the periods will vary with the working conditions. A rope which makes a large number of journeys on a wet incline will need lubrication every week, whereas a rope which makes only a few journeys in the dry may be kept in good condition by less frequent treatment. Excellent results have been obtained on endless rope haulages where the rope is lubricated continuously. In one instance a light mineral oil is allowed to drip on to the moving rope at the rate of one drop per yard; this rope works on a comparatively clean and dry roadway.

Research is in progress as to the best type of oil for applying to ropes in service. At the moment it would seem that the best results are obtained with a medium heavy mineral oil. The oil must be free from acidity, and should contain no filler or soapy material.

Hot Neck Grease

Asphaltic Residue	10 lb.
Candle Tar Pitch	20 lb.
Paraffin Cylinder Stock (700 Fire Test)	70 lb.

Heat to 550° F. and blow with air until melting point of 200° F. is obtained.

Above is cast into blocks and used for the lubrication of roller necks in steel mills.

High Temperature Lubricants
British Patent 431,066

Lubricants for use at high temperatures, e.g., in internal-combustion engines, consist of lubricating oil in which is dissolved or dispersed chromium or an organic compound thereof, and one or more other substances preventing sludging, e.g., organic compounds of tin and/or lead. Up to 1% of each addition is suitable. For example, 0.5 lb. of chromium oleate, 0.1 lb. of tin oleate, and 0.1 lb. of tetraethyl lead are added to 100 lb. of a compounded vegetable and mineral lubricating oil; or 0.4 lb. chromium oleate and 0.1 lb. of tin oleate to 100 lb. or a paraffinic mineral oil.

Non-Chilling Lubricants
Formula No. 1

Mix

Castor Oil	3 cc.
Paraffin, Chlorinated (30% Chlorine)	7 cc.
Spindle Oil, Russian	190 cc.

This gives a highly cold-resistant, clear oil.

No. 2

Mix

Castor Oil	10 cc.
Paraffin, Chlorinated (30% Chlorine)	10 cc.
(Heat to 200° C.)	
Spindle Oil, Russian	80 cc.

No. 3

Spindle Oil, Russian	40 cc.
Paraffin, Chlorinated (40% Chlorine)	40 cc.
Castor Oil	20 cc.

Rod Lubricant

a. Ceresin, Yellow	25 g.
Sperm Oil	25 g.
Tallow	50 g.

Melt together.

or

b. Ceresin, Yellow	1 g.
Spindle Oil, Refined	3–8 g.

Melt at low temperature.

Solid Lubricant
Formula No. 1
Canadian Patent 344,966

Heavy Distilled Naphthenic Petroleum	30.8 lb.
Residual Naphthenic Petroleum	13.6 lb.
Stearic Acid	14 lb.
Oleostearin	28 lb.
Caustic Soda	6.6 lb.
Water	7 lb.

No. 2
Canadian Patent 344,967

Viscous Naphthenic Petroleum	43 lb.
Animal Fat	39.4 lb.
Aluminum Stearate	4.7 lb.
Caustic Soda	5.3 lb.
Slaked Lime	0.6 lb.
Water	7 lb.

Hard Grease

Train Oil Fatty Acid	12 g.
Lime, Hydrated	2 g.
Zinc Oxide	2 g.
Spindle Oil	82 g.
Water	2 g.

Melting point 75° C.

Graphite Lubricant
U. S. Patent 2,003,564

Degras (Free from Fatty Acids)	20 lb.
Kerosene	16 lb.
Water	75 lb.
Turpentine	8.7 lb.
Ammonia (28%)	4.4 lb.
Graphite Powder	30 lb.

Watersoluble Oil

Naphthenesulphonic Acids	15 g.
Olein (or Liquid Wool Fatty Acid)	5–7 g.
Spindle Oil, Refined (60° C.)	75 g.
Caustic Potash (25° Bé.)	until neutral
Hexalin and Tetralin (1 : 1)	3–4 g.

Mineral Oil Soluble Castor Oil

To obtain castor oil which will be soluble in mineral oil, heat 70 parts of the former with 30 parts of trichloroethylene for 2 hours in a closed vessel at 130° C. The pressure will increase to 2 atmospheres. After distilling off excess solvent, the resulting castor oil will be soluble in mineral oil. This result can not be brought about by heating the oil alone or by refluxing with solvent. A second method is to heat in an autoclave 90 parts of castor oil with 10 parts of carbon tetrachloride for 2 hours at 140°. The pressure increases to about 1½ atmospheres. Dissolve in mineral oil and distil off excess solvent, removing the last traces by distillation in vacuo.

Lubricant Insoluble in Organic Solvents

Mix to a paste the following:

Anhydrous Glycerin	25 oz.
Dextrin	7 oz.
Pure d-Mannitol	3.5 oz.

Heat carefully with constant stirring until the solid material is dissolved and the solution begins to boil, then cool to room temperature with stirring. To increase the viscosity, add more dextrin; to increase fluidity add more glycerin; to increase greasiness add more mannitol.

Tempering Fats (Bath to Quench and Harden Steels)

Formula No. 1

Peruvian Bark Powder	500 g.
Neatsfoot Meal	500 g.
Salt	850 g.
Saltpeter	250 g.
Potassium Ferrocyanide	15 g.
Soft Soap	1000 g.

No. 2

Beef Tallow	10 g.
Potassium Ferrocyanide, Powder	2 g.
Wax	2 g.
Colophony (Rosin)	2 g.

Waterproofing, Perilla Oil

One method is to react one part of straight phenolic resin with 2 or 3 parts of perilla oil at between 500° and 550° F. If polymerized perilla oil is used, even better results are obtained. Another method is to employ some wood oil. For instance, one part of straight phenolic resin to 2 parts of wood oil may be reacted together and then extended with various amounts of polymerized perilla oil. Another formula is phenolic resin 5 parts, wood oil 10 parts, perilla oil 85 parts. Another is 10 phenolic resin, 20 wood oil, and 70 perilla oil. All parts are by weight.

Coloring Lubricating Oils
British Patent 424,205

Lubricating oils are improved in color by adding a solution in mineral oil or other blending agent of the product obtained by heating together until fluorescence develops, an acridine, rhodamine, eosine, or eurhodine dye with stearic acid and a water-insoluble soap. Soaps specified are aluminium stearate, magnesium stearate, oleate, or resinate, and zinc soaps. For example, 1 lb. of phosphine 5G., 1 lb. of stearic acid, and 3 lb. of aluminium stearate are heated to 120° C. until the fluorescence is a maximum; the mixture is cooled, pulverized, and dissolved to a 10% solution in a mineral oil miscible with lubricating oil. 0.25–0.5 gal. of the solution is added to 100 gal. of lubricating oil.

Refining Lubricating Oil
U. S. Patent 2,020,954

Stock of about 68 viscosity index is subjected to the simultaneous action of 10% of aluminum chloride and 10% of fuller's earth at a temperature of about 350° F. for ½ hour.

Purification of Lubricating Oil

If lubricating oil is shaken with phenol, the lower layer consists of oil and impurities in phenol; the upper layer consists of phenol dissolved in pure oil. The phenol is removed and recovered by distillation or by washing with sulphuric acid.

Dewaxing Mineral Lubricating Oil
U. S. Patent 2,014,629

Amorphous wax is eliminated by treating the wax bearing oil with 3 to 10% of substantially anhydrous aluminum chloride at a temperature of about 200° for a half to four hours, thinning with a light distillate, chilling and filtering.

Dewaxing Oil
U. S. Patent 1,978,010

A process for treating wax-oil mixtures comprises mixing 1 to 4 volumes of methylene chloride with 1 volume of the mixture, chilling the mixture to a temperature below 0° F. and filtering precipitated wax from the mixture.

Preventing Discoloration of Oils and Fats
British Patent 410,834

Discoloration of animal or vegetable oils or fats on exposure to air and light is prevented by incorporating not more than 0.05% of colloidal copper, cobalt, cadmium or silver, or of the carbonate of cobalt, copper, lithium, manganese, cadmium, barium, bismuth, the nitrate of calcium, beryllium, or lithium, the acetate of sodium, copper, manganese, the hydroxide or cobalt, beryllium, copper, thorium or of a mixture of cobalt carbonate and copper carbonate with or without bismuth subcarbonate.

Reclaiming Used Lubricating Oil
U. S. Patent 1,936,901

Used Lubricating Oil	100 gal.
Red Oil	1 gal.
Calcium Hypochlorite	6–8 gal.
Sulphuric Acid	6 lb.

Mix together and then add:

Sodium Silicate	50–100 lb.
Water	10–20 gal.

Heat at 52–122° C. for two hours.

Cool; add water, 3 gal., and separate clear oil.

Fat and Oil Bleaching

In refining fats and oils the color is improved by adding 8 to 10% soap stock to the fat.

Decolorizing Tea Seed Oil

Kaolin	25 lb.
Animal Charcoal	20 lb.

The above mixture has been found to give the most economical results.

Increasing Viscosity of Mineral Oils
British Patent 416,513

Thickened mineral oils which form gels at room temperatures are obtained by

dissolving less than 2% of cellulose stearate or palmitate in the heated oil.

Oil Filter Mass

U. S. Patent 1,940,317

Cotton Waste	75 oz.
Curled Hair	25 oz.

Fat Hydrogenation Catalyst

The catalyst is prepared as follows: Precipitate a solution of 160–300 g. per liter nickel sulphate with a 15° Bé. sodium carbonate solution at not over 32–65° C., filter on a filter press, wash till free from sulphates with water at 30–50°, dry 4 to 5 hours at 100–105°, grind, sieve, mix with sunflower seed oil and reduce by heating the oil in presence of hydrogen; time of reduction is 5 hours; the temperature is raised to 170–200° during the first hour, to 200–240° during the next two hours and to 240–245° during the last 2 hours. Reduction of the catalyst can be carried out in the same autoclave as the subsequent hydrogenation. The activity of the catalyst lasts over a prolonged period.

MATERIALS OF CONSTRUCTION

Metal Cleaning

Many "mysterious" finishing troubles are due to improper cleaning. What cleaning materials and methods to select will depend upon: (1) the size and character of articles to be cleaned, (2) their surface condition, (3) the volume of work to be handled, (4) the kind of finish to be applied, and (5) various conditions peculiar to the particular factory department wherein the cleaning is to be performed.

Rust, dust, greases, and grit can be cleaned off metal surfaces by the use of one or more of several methods. They may be burned off, chemically removed with an acid or an alkali solution, absorbed by gasoline or naphtha, buffed, or removed by sandblasting.

Old varnish or paint may be removed by the burn-off process, preparatory to refinishing. A temperature of 650° to 700° F. is required to dislodge the old coating which can then be wiped off with a rag while still hot. The burn-off (oven) process is also a means of drying washed and chemically treated parts.

Heavy rust spots are usually removed by wirebrushing, sandpapering or sandblasting. Thin coatings of rust may be removed either by kerosene or gasoline or by pickling in a solution made of commercial sulphuric acid diluted in water. Other solutions used are: (1) A 20% solution of sodium citrate and water, (2) a 10% solution of ferrous sulphate and water, and (3) a 3½% solution of boric acid and water.

Aluminum parts are prepared for a baked finish by a thorough cleaning with gasoline or naphtha, and a subsequent oven-drying. Old paint and varnish may be removed from aluminum with any standard paint or varnish remover.

Metal Cleaning Composition
Canadian Patent 345,172

A compound containing trisodium phosphate and sodium dichromate is used for cleaning tin-coated metal. It inhibits checking or spangling. A satisfactory composition contains trisodium phosphate 55 lb., sodium carbonate 40 lb., and sodium dichromate 5 lb.

Cleaning Metal Before Painting

Apply

Ammonia (28%)	1 l.
Alcohol	26 l.
Water	25 l.

Wipe off metal thoroughly after application.

Cleaning Iron and Steel
U. S. Patent 1,943,875

Prior to galvanizing or tinning the metal is exposed to the fumes of 1 to 2% of phosgene at 100–200° C.

Cleaning Tin Surfaces

a. A bath is made up of palm oil that has been heated to 300° F. Any method of heating may be employed as the flash point of the palm oil is quite high. Generally speaking, there is no danger of overheating. Probably the most practical method of heating is by using a steam coil in the palm oil container, as the temperature may be easily controlled.

The work is dipped into the solution of heated palm oil for two to three minutes and removed. No further processing is required for the palm oil is quite liquid at this temperature and will flow freely from the work. It may be found necessary to remove some of the oil by using an air blast to blow the oil from the work.

The method suggested above will operate well on small work. However, if the work is large, it may be necessary to preheat the work before immersing it into the oil bath. Without preheating heavy work, the oil will cool too quickly when the work is being removed from the solution and will leave an unsatisfactory waxy deposit on the work. The preheating is best accomplished by immersion in superheated water long enough to heat the work sufficiently. Upon removing the work from the heated water, it may be immersed immediately in the palm oil bath.

b. Another method that may be used with good results is to immerse the work in a 2% solution of water and nitric acid. This procedure is most efficient if the work is first preheated in water as suggested in Method *a.* The acid dip is immediately followed by immersion in a rinse of kerosene oil. The duration of the acid dip must be found by experiment as the length of dip depends upon the thickness of the oxide. This may be easily determined by the trial and error method. Too short a dip does not restore the luster, and too long a dip increases the tarnish and produces a spangle effect as in galvanizing. The acid dip and kerosene rinse are operated at room temperature.

The drying of the work is best accomplished by drying in heated sawdust. Care must be exerted in this operation as machined work will rust if it is not dried thoroughly and quickly.

The success of cleaning of tinned work depends upon the quality of the tinning that was on the work originally. It is impossible to produce a luster on an article that had a poor finish in the first place.

Cleaning Monel Screw Machine Parts

The use of sulphur base cutting oil in high speed automatic screw machine operations, may discolor the Monel metal parts. This discoloration is due to the formation of metallic sulphides by the sulphur in the oil.

The discoloration is readily removed by dipping the parts in a cold solution of sodium cyanide. The solution is made up in the proportions of water 1 gal., sodium cyanide ½ to 1 lb. The time required for cleaning is from 5 to 30 minutes, depending on the degree of discoloration. Caution should be used in handling this solution as it is a deadly poison.

Coloring Metals

Metals are colored chemically or electrochemically by producing thin films of oxide, sulphide, phosphide, silicide, nitride and carbon on their surface. For quantity production, coloring is usually carried on in a rotating drum, while large pieces and objects of art are treated by hand. A few recipes follow:

1. For Copper

a. Brown: immersing in molten sodium nitrate, or imbedding in a paste of 15 parts ammonium carbonate and 5 parts each of copper acetate, tartaric acid in vinegar, and salt; another solution is 25% copper sulphate, 25% nickel sulphate, 12% potassium chlorate, 7% potassium permanganate.

b. Gray-black: a hot watery solution of 12% copper sulphate and 1% potassium permanganate.

c. Black: 40–50° C. (104–122° F.) warm solution of 600 g. copper nitrate in 200 g. water and 2.5 g. silver nitrate in 10 g. water is brushed on the object and dried at 230° C. (446° F.); or a solution of 10% sodium chlorate, 5% caustic soda and 10% potassium persulphate is used for immersion.

d. Green patina: solution of 25% ammonium chloride, 25% ammonium carbonate, or an acetic acid with an addition of 1–2% tartaric acid.

e. Blue: 80° C. (176° F.) hot solution of 13% thiosulphate and 3.5% sugar of lead, or of 100 g. potassium chlorate, 100 g. ammonium nitrate and 1 g. copper nitrate in 1 l. water. The objects are immersed for 5–10 minutes.

f. Purple-gray: immersion in a solution of antimony trichloride in water with an addition of equal weight of 5% hydrochloric acid.

2. For Zinc

a. Yellow: aqueous solutions of 5% copper sulphate, 5% sal ammoniac and 3% ammonium chloride are brushed on.

b. Black: solution of 16% copper sulphate, 8% potassium chlorate in 1 l. water; or a cold solution of 8 parts hydrochloric acid, 3 parts copper chloride, and 2 parts copper nitrate in 64 parts of water.

c. Iridescent: immersing in a solution of 3 parts tartrate of copper oxide and 4 parts of caustic soda in 48 parts of water. According to duration of immersion, purple, blue, green, yellow or red hues are obtained.

d. Purple: immersing in a warm bath —60° C. (140° F.)—of 60 g. nickel ammonium sulphate, 60 g. ammonium chloride, 1 l. water.

e. Steel-blue: a bath of 60 g. cobalt ammonium sulphate, 60 g. ammonium chloride, 1 l. water.

3. For Tin

Tin, before coloring, is either copper- or brass-plated and then treated as given for these metals.

4. For Aluminum

Aluminum can generally be colored black only, either by burning in a layer of carbon produced by linseed oil or al-

bumen, or by immersing in a 5% platinum chloride solution in water or 1% platinum chloride solution in alcohol, and left to dry in 150° C. (302° F.). The methods used for black-coloring of copper can also be applied.

5. For Iron

Black can be obtained by burning in linseed oil, tallow or wax at 400° C. (752° F.) in rotating drums, or in aqueous solution of 2% copper chloride, 2% bismuth chloride, 4% mercury chloride, 12% hydrochloric acid and 10% alcohol; the object is boiled in this solution. Iron can be burnished at 100° C. (212° F.) in a solution of 1% ferrous chloride, or 7% ferrous chloride and 0–2% mercury chloride with addition of a few drops of hydrochloric acid. A reddish-brown is obtained by applying a solution of 15 g. ferric chloride in 1 l. water and leaving it in for a few hours.

6. For Silver

Black is obtained by either a 1% aqueous solution of ammonium sulphide or a 5% solution of ferric chloride and rinsing in 2% caustic soda.

7. For Gold

A red-gold tint is produced by a warm solution of 115 parts salt, 230 parts saltpeter, 170 parts hydrochloric acid and 150 parts water; or of 3 parts hydrochloric acid, 1 part nitric acid, 2 parts salt in 40 parts water.

8. For Nickel

Treating with platinum chloride or sal ammoniac containing ammonium sulphide gives black and gray tints.

Black Finishing Chromium Plate
U. S. Patent 1,937,629

Immerse articles for 20–30 minutes in:

Sodium Cyanide	45 lb.
Soda Ash	35 lb.
Salt	20 lb.

at temperature of 700–900° C.

Coloring Copper a Green-Blue

A malachite coating is formed on a copper anode in an aqueous solution of an alkali carbonate (8% sodium bicarbonate), using a c.d. of 1–20 amp./sq. dm. The coating may be applied to copper roofs, etc., by means of a cloth-covered roller soaked in the electrolyte. The coating is green and adherent, and changes to brochantite within a year without flaking.

Coloring Brass
Cheap Rose Gold Finish

The work which must be brass is placed in the following dip until a smut is produced:

Copper Sulphate	16 oz.
Muriatic Acid	½ gal.
Water	1 gal.

Dissolve the copper sulphate in the water and then add the acid. The work should have a deep red smut which should be lightened somewhat by placing in a saturated salt solution for a few seconds. Plate in the regular fine gold solution, then relieve the high lights with bicarbonate of soda, replate in gold solution for a few seconds, dry and lacquer.

Blue Black Color

Copper Carbonate	1 lb.
Ammonium Hydroxide	1 qt.
Water	3 qt.

Add the water after the copper carbonate and the ammonia have been thoroughly mixed. Use at a temperature of 175° F. and immerse the work until the color is obtained (usually from ½ to 1 minute). There must be excess copper carbonate.

Verde Finishes
Formula No. 1

White Arsenic	8 oz.
Muriatic Acid	1 qt.
Copper Acetate	2 lb.
Copper Carbonate	½ lb.
Ammonium Chloride	2 lb.
Water	2 gal.

Dissolve the arsenic in the muriatic acid with the aid of heat and then add the copper carbonate. Dissolve the copper acetate and the ammonium chloride in the water and mix the two solutions thoroughly. This is used with a brush. If desired as an immersion, reduce to twice the volume with water.

No. 2

Copper Acetate	4 oz.
Copper Nitrate	4 oz.
Ammonium Chloride	4 oz.
Water	1 gal.

No. 3

Copper Nitrate	8 oz.
Ammonium Chloride	4 oz.
Acetic Acid	4 oz.
Chromic Acid	1 oz.
Water	1 gal.

Apply lightly with brush and let dry. If finish is not even, brush again with the verde solution and let dry.

Verde Color
(Tiffany Green)

Copper Sulphate	8 oz.
Ammonium Chloride	4 oz.
Sodium Chloride	4 oz.
Zinc Chloride	1 oz.
Acetic Acid	2 oz.
Water	1 gal.

The addition of 1 oz. of glycerin will prevent the green from drying too fast and produce a more even color. This solution is used for immersion and if the color is not uniform, repeat immersion as many times as desired, allowing the work to dry thoroughly between immersions.

Electrolytic Verde Finish

Potassium Bichromate	8 oz.
Copper Sulphate	12 oz.
Water	1 gal.

Use solution at a temperature of 80° F.; lead anodes and 8 to 10 volts. Then set color in an alkaline solution.

Brown on Brass
Formula No. 1

Golden Sulphuret of Antimony	4 oz.
Caustic Soda	8 oz.
Water	1 gal.

Use as near the boiling point as possible.

Scratch brush dry. If the color is not dark enough, pass through a dip composed of 2 oz. sulphuric acid, water 1 gal.

No. 2

"Liquid" Sulphur	1 oz.
Water	1 gal.

The work is immersed in this solution for a minute or so and then without rinsing immersed into a solution made of sulphuric acid 1 oz., nitric acid 1 oz., water 1 gal. If color is not dark enough, repeat both dipping operations and scratch brush dry.

Blue Color on Brass

Hyposulphite of Soda	8 oz.
Lead Acetate	4 oz.
Water	1 gal.

Use at boiling temperature and immerse just long enough to produce blue color.

Green Color on Brass

Nitrate of Iron	2 oz.
Hyposulphite of Soda	8 oz.
Water	1 gal.

Use boiling temperature.

Verde Color on Brass

Copper Nitrate	16 oz.
Ammonium Chloride	4 oz.
Acetic Acid	1 qt.
Water	3 qt.

Immerse the work and let dry. If color is not uniform use a painter's sash brush which is moistened with the solution and stipple lightly.

Old English Finish on Brass

Two solutions are necessary to produce this finish, one a sulphur solution the other an acid solution.

Formula No. 1

Liquid Sulphur	½ oz.
Water	1 gal.

No. 2

Copper Sulphate	2 oz.
Water	1 gal.

The work is thoroughly cleaned in an alkaline cleaning solution, then dipped in No. 1 solution, and without rinsing dipped in No. 2 solution. These dips are only momentary. Rinse in clean cold water and repeat dipping operations until a light color is produced.

For an even finish, scratch brush, dry and repeat dipping operations in solutions No. 1 and No. 2; finally scratch brush dry and lacquer.

Coloring Brass or Copper
(Use Brush or Immersion)

Black

Potassium Sulphide	2 oz.
Ammonium Chloride	2 lb.
Water	1 gal.

Brown

Ammonium Sulphide	2 oz.
Water	1 gal.

Blue Green (180° F.)

Sodium Thiosulphate	1 oz.
Iron Pernitrate	8 oz.
Water	1 gal.

Rust Brown

Barium Sulphide	2 oz.
Water	1 gal.

Red (120° F.)

Copper Sulphate	4 oz.
Salt	2 lb.
Water	1 gal.

Verde Green (75° F.)

Copper Nitrate	5 oz.
Ammonium Chloride	5 oz.
Chloride of Lime	5 oz.
Water	1 gal.

Coloring Bronze

Formula No. 1

Use a boiling or near-boiling solution containing 50 to 60 g. copper sulphate per liter of water. Additions of alum (potassium aluminum sulphate) give colors tending toward the violet-red. About 20 g./l. are recommended.

Additions of verdigris give olive-green colors. About 30 g./l. are recommended, with further additions of 5 to 10 g./l. if desired.

A very pretty red may be obtained from the following:

Copper Sulphate	62.5 g.
Verdigris	10 g.
Alum	25 g.
Water	1 l.
Acetic Acid	few drops

Exact reproduction of this color is sometimes difficult.

No. 2

Bronze may be colored in the following:

Sodium Chlorate	50 g.
Copper Sulphate	125 g.
Water	1 l.

If copper nitrate is used instead of copper sulphate, less sludge is obtained. 148 g. of copper nitrate should be used.

The following colors are obtained:

Solution near boiling—greenish gold-brown obtained in 5 minutes.

Solution near boiling—gold brown obtained in 10 minutes.

Solution cold—yellow brown obtained overnight.

The effects of additions are as follows:

Addition of ferrous sulphate—slight change toward olive green.

Addition of ferric ammonium sulphate—similar to above but lighter in color.

Addition of ferric sulphate—similar to above but with strong etching.

Addition of nickel sulphate—increase in yellow brown.

Addition of ammonium sulphate—lighter color and more yellowish brown, partly toward greenish.

No. 3

Antique Green-Oxidized Effect

After cleaning, dip and/or brush with stippling effect, using the following solution:

Water	1 gal.
Iron Chloride	3 oz.
Sal Ammoniac	16 oz.
Verdigris Powder	8 oz.
Common Salt	10 oz.
Cream of Tartar	4 oz.

No. 4

If bronze is being exposed to the atmosphere, rub it with cotton waste soaked in boiled linseed oil to obtain, on aging, a dark brown adherent color.

No. 5

For brown, reddish bronze, or blue-black tones use:

Water	1 gal.
Liver of Sulphur	2 oz.
Caustic Soda	3 oz.

Use a temperature of 160° to 180° F. The time of exposure to the solution determines the color.

Coloring of Copper

The pieces to be colored are first cleaned of all oil and grease with gasoline and then lightly etched in the following solution:

Water	90 oz.
Concentrated Sulphuric Acid	10 oz.

They are then thoroughly washed in water before immersion in one of the following coloring solutions.

Brown to Steel Blue Color

Liver of Sulphur	2 g.
Salt	3 g.
Water	100 g.

This bath works better when kept warm. The pieces are left in the bath until the desired color has been obtained.

Gray-Brown Color

Iron Chloride	3 g.
Water	100 g.

The pieces are heated and dipped.

Brown Color

Powdered Copper Sulphate	100 g.
Zinc Chloride	100 g.
Water	200 g.

This forms a paste which is smeared over the surfaces to be colored and allowed to dry.

Other Brown Coloring Solutions

Liver of Sulphur	5 g.
Carbonate of Ammonia	10 g.
Water	250 g.
Copper Acetate	10 g.
Ammonium Chloride	5 g.
Ammonia (10%)	25 g.
Vinegar	160 g.

This is brushed on.

Old copper effects are obtained by brushing sulphuric acid in the depressions and thoroughly washing off after the desired amount of green oxide has been formed.

After the colored pieces have been thoroughly washed and dried they should be polished and given a preservative coat of a suitable lacquer or the following mixture:

Carnauba Wax	100 g.
Japan Wax	100 g.
French Turpentine	1000 g.

Coloring Copper

Formula No. 1

Potassium Chlorate	1 oz.
Copper Sulphate	4 oz.
Water	1 gal.

Use hot, scratch brush wet. If color is uneven, repeat coloring operation and scratch brush dry.

No. 2

A darker or more red color is produced in this solution.

Copper Sulphate	4 oz.
Nickel Sulphate	2 oz.
Potassium Chlorate	1 oz.
Water	1 gal.

Finishing operations are the same as above.

No. 3

Various shades of bronze from a chocolate color to a black can be produced in this solution.

Potassium Sulphide	½ to 1 oz.
Water	1 gal.

For the light shades use cold and a short time of immersion. For darker, use hot, with longer immersion.

No. 4

Various colors are produced in any of the following solutions used either hot or cold.

Yellow Barium Sulphide	1 oz.
Water	1 gal.

No. 5

Yellow Barium Sulphide	1 oz.
Calcium Sulphide	½ fl. oz.
Water	1 gal.

No. 6

Golden Sulphuret of Antimony	½ to 1 oz.
Caustic Soda	1 to 2 oz.
Water	1 gal.

No. 7

Copper Sulphate	12 oz.
Acetic Acid	4 oz.
Caustic Soda	4 oz.
Water	1 gal.

No. 8

Copper Sulphate	4 oz.
Copper Acetate	2 oz.
Potassium Chloride	6 oz.
Water	1 gal.

No. 9

Copper Sulphate	8 oz.
Potassium Permanganate	1 oz.
Water	1 gal.

Coloring Silver

Formula No. 1

Sulphide Coloring

Dip in solutions of sodium or potassium sulphide.

No. 2

Tellurium Black

Dissolve 1 oz. of pure tellurium dioxide in 16 oz. concentrated hydrochloric acid to which have been added 8 oz. water. Boiling the solution will probably be necessary.

The solution so obtained should be diluted with water, the amount depending on the anticipated use. For brushing, use about 1 part of the above with 2 parts water. For dipping, a much weaker solution is advisable.

Better results are obtained from a hot than from a cold solution.

No. 3

Platinum Black

Silver placed in hot 5% platinic chloride solution rapidly turns jet black.

No. 4

Iron Oxide Finish on Silver

Immerse the silver for about 5 seconds in a solution containing 1200 g. ferric chloride per l. water.

Rinse the article and immerse for 15 seconds in a solution containing 20 g. caustic soda per l. water.

Better results are obtained if the article is made the cathode in the latter solution.

No. 5

Black Nickel

For relief designs on silver, black nickel is often used. The presence of

zinc or copper in a nickel plating solution will cause distinct darkening of the nickel deposit. A simple formula is:

Water	1 l.
Nickel Ammonium Sulphate	50 g.
Ammonium Thiocyanate	10 g.
Zinc Sulphate	6 g.

Carbon anodes are used, and the silver article is made the cathode at about 3 amperes per sq. ft. Excess black nickel is removed with a tampico wheel and pumice.

No. 6

Pink Color on Silver

A pink color may be given silver by immersing it in a hot solution of copper chloride.

Antique Silver Finish

Formula No. 1

Roughen surface (as by acid dipping) and then dip into the following solution:

Lead Acetate	3 g.
Sodium Thiosulphate	140 g.
Water	1 l.

Temperature 140° F.

No. 2

Dip article into following solution:

Ortho Arsenic Acid	50 g.
Sodium Carbonate	20 g.
Potassium Cyanide	25 g.
Water	1 l.

Add the chemicals to the water in the above order, with thorough mixing of each.

No. 3

Dip article into solution containing 15 g. potassium sulphide per l. of water. Rinse in water and dip into following:

Copper Sulphate	9 g.
Sulphuric Acid (Conc.)	3 g.
Water	1 l.

Polish article with fine pumice and dip into weak solution of potassium cyanide containing sodium hydroxide.

Imitation Antique Silver Finish

An imitation antique silver appearance may be given iron, for example, by first cadmium plating it, and then dipping it in the following:

Potassium Chlorate	60 g.
Cupric Nitrate	40 g.
Water	1 l.

Preventing Flaking in Steel

Flakes, especially in steels of the S.A.E. 3312 type, can be avoided by thoroughly deoxidizing before adding the iron alloys, by mixing the bath well, by pouring at 1420–50°, by slow cooling and heating in the range 300–700°, and by forging at high temperature.

Coating Iron with Aluminum

British Patent 432,212

Iron wire is exposed to ammonium chloride vapors at 500–700° C. and passed directly into a bath of molten aluminum.

Phosphate Coating for Steel

Canadian Patent 351,060

Sodium Nitrate	100 lb.
Manganese Acid Phosphate	115 lb.
Copper Carbonate	19 g.
Water	400 gal.

Coating Steel with Zinc Phosphate

U. S. Patent 1,926,265

Dip steel in:

Zinc Cyanide	3 lb.
Zinc Acid Phosphate	15 lb.
Water	100 lb.

while heated at 75° C.

Foundry Parting Powder

British Patent 412,931

Kieselguhr 92–97.5 lb., wax 6–2 lb. and resin 2–0.5 lb, the kieselguhr being thoroughly mixed with the molten wax and, after cooling, the mixture being ground with the powdered resin.

Improving Malleable Iron Castings

U. S. Patent 2,024,014

The process for the heat treatment of malleable iron castings containing 0.6 to 5% copper comprises heating the malleabilized castings to a temperature in the range of approximately 700 to 850° C.; cooling at a rate greater than approximately 25° C. per hour to a temperature in the range of approximately 400 to 600° C.; and without further cooling maintaining in that temperature range for sufficient time to produce a substantial increase in hardness.

Increasing Carbon Content of Iron

U. S. Patent 2,021,159

Add to molten metal after leaving cupola a mixture of:

Sodium Nitrate	20 lb.
Carbonaceous Material	80 lb.

Case Hardening Composition
Formula No. 1
U. S. Patent 2,002,180

Sodium Cyanide	9 lb.
Barium Chloride	6 lb.
Barium Carbonate	8 lb.
Calcium Fluoride	2 lb.

No. 2
U. S. Patent 1,952,090

Calcium Chloride	20 lb.
Salt	10 lb.
Sodium Cyanide	0.15–0.3 lb.

No. 3
U. S. Patent 1,942,937

Heat metal at 1010–1065° C. in a mixture of:

Charcoal Powder	40 lb.
Hardwood Sawdust	24 lb.
Manganese	20 lb.
Chromium	5 lb.
Borax	8 lb.
Chopped Pea Plants	3 lb.

allowing free access of air.

No. 4
British Patent 412,173

Metal is dipped in following:

Ground Rice	31 lb.
Barium Carbonate	21 lb.
Caustic Soda	1 lb.
Glucose	5 lb.
Silica	3 lb.
Water	39 lb.

After drying the coated metal, heat to 900–950° C. in a non-oxidizing atmosphere.

Hardening Steel
Formula No. 1
Austrian Patent 142,401

Potassium Ferrocyanide	70–80 kg.
Soda Ash	2–5 kg.
Salt	6–12 kg.
Acetylene Carbon	3–8 kg.
Potassium Carbonate	2–3 kg.
Ammonium Chloride	2–3 kg.
Gum Arabic	2–3 kg.

The above mixture is strewn over the steel which is then heated.

No. 2
U. S. Patent 2,016,477

Soybean Powder	90 lb.
Sodium Cyanide	3 lb.
Salt	0.8 lb.
Soda Ash	0.2 lb.
Ammonium Chloride	4 lb.
Barium Carbonate	1 lb.
Potassium Dichromate	1 lb.

No. 3
British Patent 416,179

Coat with following and heat to carburizing temperature:

Carbon Powder	40 lb.
Barium Carbonate	20 lb.
Nickel Steel (20%) Turnings	15 lb.
Asbestos Fiber	12 lb.
Sodium Silicate (d. 1.33)	13 lb.

No. 4
Patented

Immerse in a fused salt bath of:

Calcium Cyanide	15–40 lb.
Sodium Nitrate	20–40 lb.
Barium Carbonate	10–15 lb.
Salt	5–10 lb.

Temperature is maintained at 760–960° C. and a current of ammonia gas is passed through the bath to produce a nitride case.

Air Hardening Steel
U. S. Patent 1,976,341

An air quenched article of alloy steel is composed of about 3 to 4% copper, about 0.1 to 0.25% carbon, and about 1.5 to 2% manganese, the balance being substantially all iron.

Hydrogen Chloride Resistant Steel
German Patent 596,023

Copper	43–74 kg.
Nickel	10–25 kg.
Zinc	3.5–14.5 kg.
Tantalum	0.5–7 kg.
Manganese	0.3–1.5 kg.
Bismuth	0.2–8.5 kg.
Molybdenum	0.4–7 kg.
Silver	0.1–4.5 kg.

Surface Carbonization of Steel
U. S. Patent 1,950,116

Etch surface in 15% nitric acid; wash; dry; heat at 900° C. in a hydrocarbon vapor.

Anti-Carburizing Composition
U. S. Patent 1,982,718

Copper Chloride	2 lb.
Oxalic Acid	3 lb.

Lead Oxide	1 lb.
Copper Sulphate	5½ lb.
Water	5 lb.

Metallographic Etching Agent

Copper Ammonium Chloride	3 g.
Hydrochloric Acid	50 cc.
Ferric Chloride	15 g.
Water	25 cc.

Etching Hardened Steel

Mercuric Nitrate	5 oz.
Nitric Acid	38.5 oz.
Water	89.5 oz.

Etching Stainless Steel

Formula No. 1

Nitric Acid	32 oz.
Hydrochloric Acid	3 oz.
Denatured Alcohol	16 oz.
Water	96 oz.

Solution used cold.

No. 2

Ferric Chloride	20 g.
Hydrochloric Acid	20 g.
Water	60 cc.

This solution may be used warm at 120° F. or electrolytically.

Steel Pickling Inhibitor

U. S. Patent 1,932,015

Di-o-tolylthiourea	4 lb.
Evaporated Waste Sulphite Liquor	6 lb.
Salt	10 lb.
Soda Ash	1 lb.

The above is formed into blocks.

Metal Pickling Inhibitor

Canadian Patent 353,320

Pyridine	80 g.
Benzyl Chloride	140 g.

Heat to 160–170° C. and cool to 75–100° C. and then dilute with any solvent.

Ore Briquettes for Open Hearth Furnaces

Ore	100 lb.
Cast Iron Shavings	10 lb.
Salt	1 lb.

More satisfactory results are gotten by using above briquettes than when using dust ore.

Age Hardening Silver

U. S. Patent 1,984,225

Sterling silver capable of age hardening to a hardness of from 84 Rockwell B to 94 Rockwell B consists of pure silver at least 92.5%, copper 2.5 to 7.4% and aluminum 0.1 to 5%.

A process of making sterling silver articles of a hardness of from 80 Rockwell B to 94 Rockwell B consists in first alloying at least 92.5% silver, from 7.4 to 2.5% copper and from 0.1 to 5% of a metal selected from the group consisting of aluminum, magnesium, lead, antimony, and beryllium, then fabricating the article to form by known cold working operations, then subjecting the article to a preliminary anneal and quench from about 1150° F. to 1400° F. and finally subjecting the article to an age hardening heat of about 570° F. for about one hour.

PHYSICAL PROPERTIES OF METALS

Metal	Specific Gravity	Specific Heat	Melting Point Deg. Centigrade	Melting Point Deg. Fahrenheit	Weight in Lbs. per Cubic Inch
Aluminum:					
(Cast)	2.56	.2185	658	1217	.0924
(Rolled)	2.71	....	....	....	.0978
No. 3S Alloy (Rolled)	2.74	....	....	....	.0989
No. 12 Alloy (Rolled)	2.82	....	624	1156	.1018
Antimony	6.71	.051	630	1166	.2424
Bismuth	9.80	.031	271	520	.3540
Brass	8.51	.094	....	....	.3075
Cadmium	8.60	.057	321	610	.3107
Calcium	1.57	1.70	810	1490	.0567
Chromium	6.80	.120	1510	2750	.2457

PHYSICAL PROPERTIES OF METALS—*Continued*

Metal	Specific Gravity	Specific Heat	Melting Point Deg. Centigrade	Melting Point Deg. Fahrenheit	Weight in Lbs. per Cubic Inch
Cobalt	8.50	.110	1490	2714	.3071
Copper	8.89	.094	1083	1982	.3212
Gold	19.32	.032	1063	1945	.6979
Iridium	22.42	.033	2300	4170	.8099
Iron	7.86	.110	1520	2768	.2634
Iron (Cast)	7.218	.1298	1375	2507	.2605
Iron (Wrought)	7.70	.1138	1500–1600	2732–2912	.2779
Lead	11.37	.031	327	621	.4108
Lithium	0.57	.941	186	367	.0213
Magnesium	1.74	.250	651	1204	.0629
Manganese	8.00	.120	1225	2237	.2890
Mercury	13.59	.032	—38.7	—37.7	.4909
Monel Metal	8.87	.127	1360	2480	.320
Nickel	8.80	.130	1452	2646	.319
Platinum	21.50	.033	1755	3191	.7767
Potassium	0.87	1.70	62	144	.0314
Silver	10.53	.056	961	1761	.3805
Sodium	0.97	.290	97	207	.0350
Steel	7.858	.1175	1330–1378	2372–2532	.2839
Strontium	2.54	.074	....	....	.0918
Tantalum	10.80	....	2850	5160	.3902
Tin	7.29	.056	232	450	.2634
Titanium	5.3	.130	1900	3450	.1915
Tungsten	19.10	.033	3000	5432	.6900
Uranium	18.70	....	....	....	.6755
Vanadium	5.50	....	1730	3146	.1987
Zinc	7.19	.094	419	786	.2598

Protecting Aluminum from Corrosion

Immerse for 10 minutes in bath of following at 50-60° C.

Formula No. 1

Sal Soda	125 g.
Sodium Chromate	8 g.
Ammonia	25 cc.
Water	1 l.

No. 2

Anodic treatment at 12 volts for 5 minutes and 15 volts for 5 minutes in following bath:

Oxalic Acid	25 g.
Sodium Chromate	17 g.
Sodium Dihydrogen Sulphate	3 g.

Hardening Aluminum

U. S. Patent 1,930,463

Pack in a mixture of:

Magnesium	95 lb.
Magnesium Oxide	5 lb.

and heat at 420° C. in an atmosphere of carbon dioxide until the magnesium diffuses into the surface of the aluminum.

Non-Seizing Aluminum

U. S. Patent 1,978,112

Dip the aluminum in a bath of molten aluminum stearate.

Rustproofing Iron

U. S. Patent 1,949,921

Phosphoric Acid (85%)	20 fl. oz.
Ethyl Alcohol	20 fl. oz.
Water	30 fl. oz.
Isopropyl Ether	0.7–3.5 fl. oz.

Radiator "Rust" Preventative

U. S. Patent 1,940,041

Borax	36 lb.
Sodium Salicylate	30 lb.
Sodium Nitrate	7 lb.

Use 73 grains per quart of water.

Corrosion Inhibitor

Sodium Chromate	20 lb.
Paraffin Oil	15 lb.
Sulphonated Red Oil	50 lb.
Liquid Soap	2 lb.
Soap Bark Extract	5 lb.
Water	to make 100 lb.

Non-Corrosive (Ethyl) Alcohol
U. S. Patent 1,927,842

About 0.03 per cent of sodium carbonate or the equivalent of sodium acetate, borax, sodium lactate, or the corresponding potassium salts, is added to commercial alcohol to give pH 7, thereby preventing corrosion of the metal containers.

Non-Corrosive Zinc Conduit Alloy
German Patent 614,996

Zinc	83–95 kg.
Aluminum	13–3 kg.
Manganese	1–2 kg.
Cadmium or Silicon	3–0 kg.

Silver Tarnish Prevention
British Patent 430,795

A jar containing the following is placed in display cases containing silver:

Calcium Chloride, Granular	88–94.9 g.
Copper Sulphate, Anhydrous	5–10 g.
Talc	0.1–2 g.

Removing Rust from Iron
Formula No. 1
Soaking 12 hours in Petroleum

No. 2

Make up:

Spindle Oil	65 g.
Paraffin Scales or Ceresin, Yellow	15 g.
Pumice Powder	20 g.

No. 3

Dissolve:

Water	1000 g.
Stannous Chloride	10 g.
Mercuric Chloride	2 g.

No. 4

Use:

Caustic Soda	10 g.
Zinc Powder	10 g.

Removing Rust From Tools

By using a solution of ammonium citrate, rust may be completely removed from tools. If the solution is used warm, then one or two hours will suffice, but if used cold, it is best to allow the tools to remain in the liquid overnight. A tablespoonful of the ammonium citrate crystals may be used to a pint of water, although the proportions are not important. The solution will serve repeatedly until depleted.

For tools of awkward shape such as try-squares and large steel squares, a cardboard mailing container may be used in place of a vat, crock, or other container, if it is first impregnated with hot paraffin wax.

Rust and Oil Remover
U. S. Patent 1,935,911

Brush with:

Phosphoric Acid (75%)	69.5 lb.
Butyl "Cellosolve"	17 lb.
Oleic Acid	0.5 lb.
Saponin	1 lb.
Water	12 lb.

Cleaning Motor Nameplates

Cleaning tarnish, grease and dirt off the nameplate of motors and generators in order to read the figures and other data is facilitated by the use of a wad of crinkled tin foil. The nameplate is not scratched or marred by this material as is the case when an abrasive is used for removing the accumulated dirt.

Decarbonizing Lining for Cast Iron Molds
Russian Patent 35,331

Brown Iron Ore	68 lb.
Refractory Clay	30 lb.
Potassium Permanganate	2 lb.

Soldering Fluxes for Iron and Non-Ferrous Metals

Stainless Steel

Borax	75–25 oz.
Boric Acid	25–75 oz.

Make into paste with alcohol.

Galvanized Iron

Hydrochloric Acid	750 cc.
Water	250 cc.

Zinc add until no more will dissolve then add a solution of

Ammonium Chloride	50 g.
Water	170 cc.

then add following solution:

Stannous Chloride	30 g.
Water	170 cc.

To form a paste solder of this type work in potato starch to desired consistency.

Aluminum Sheets

Formula No. 1

Rosin	2 lb.
Tallow, Ox	2 lb.
Zinc Chloride	1 lb.

No. 2

Olive Oil	50 lb.
Tallow	40 lb.
Rosin, Powdered	25 lb.
Saturated Ammonium Chloride Solution	12½ lb.

Tin

Rosin, Powdered	1 lb.
Tallow	2 lb.
Olive Oil	2 lb.
Saturated Ammonium Chloride Solution	2 lb.

Aluminum Solder

Formula No. 1

Tin	76 oz.
Zinc	20 oz.
Aluminum	3 oz.
Antimony	0.6 oz.
Lead	0.2 oz.
Copper	0.2 oz.

No. 2

French Patent 775,492

The solder contains cadmium, lead and zinc in the proportions of 4, 4, 3 and 2-10% of zinc chloride.

No. 3

French Patent 776,958

Zinc	89–95 lb.
Aluminum	10–4 lb.
Silicon	0.4 lb.
Iron	0.4 lb.
Zirconium	0.2 lb.

No. 4

British Patent 426,526

Zinc	22 lb.
Tin	14 lb.
Mercury	3 lb.
Aluminum	1½–1 lb.
Lead	½–1 lb.

Aluminum Soldering Fluxes

British Patent 413,141

Claim is made for fluxes containing cadmium chloride and stannous bromide, preferably in admixture with more than one of the following: cadmium iodide, ammonium chloride, zinc chloride, zinc bromide, fluorides, chlorodiphenyl, p-dichlorbenzene. A preferred composition is stannous bromide 28, cadmium chloride 20, cadmium iodide 10, ammonium chloride 25, ammonium fluoride 2, zinc chloride or zinc bromide 5%; 4 parts of this mixture are made into a paste with 6 parts of chlorodiphenyl and/or p-dichlorbenzene.

Soldering Iron Tip Alloy

British Patent 431,637

Copper	97 lb.
Cobalt	2.6 lb.
Beryllium	0.4 lb.

Heat this for one hour at 900° C. Quench in water, reheat to 500° C. for one to two hours and allow to cool.

Cast Iron Soldering

Add to muriatic acid, zinc sufficient to "kill" it, and drop in several small pieces copper before action ceases. Use this solution on cast iron that has been filed bright, and solder in the usual way.

Hard Solder for Cast Iron

Copper	60 lb.
Zinc	40 lb.
Tin	1 lb.
or	
Iron	1 lb.

Chain Link Solder

U. S. Patent 2,003,865

Tin	1 lb.
Copper	2 lb.
Borax	3 lb.

Hard Solders

German Silver and Nickel

Silver	75 lb.
Copper	17 lb.
Tin	8 lb.

Thin Copper

Silver	65 lb.
Copper	24 lb.
Zinc	11 lb.

Heavy Brass

Silver	30 lb.
Copper	40–50 lb.
Zinc	20–30 lb.

Austentic Stainless Steels

Silver	10 lb.
Copper	50–60 lb.
Nickel	3 lb.
Zinc	37–27 lb.

Soft Soldering Monel and Nickel

Monel metal and nickel are soft soldered readily. Many of the soft

solders regularly used in the copper shop will make suitable joints in both of these metals. In making a lock seamed joint, for example, it is definitely recommended that the edges of the sheet be tinned, that is, coated with a thin film of soft solder *before* forming the sheet and *before* lock seaming.

Once the sheet has been properly tinned, it is then very easy to flow in the soft solder and make a tight joint which is reasonably strong.

Similarly, in sweating a tube into a header, if both the header and end of tube are tinned first, then assembled, heated, and solder flowed in, a sound joint will be obtained. It is necessary in all soldering work to have surfaces clean and bright if joints are to hold.

It must be remembered that the strength and ductility of soft solder is not of a very high order and for that reason soft solder is not recommended where considerable vibration is apt to be involved.

Soldering Flux for Stainless Steel
U. S. Patent 1,968,841

Boric acid, three parts; borax, two to three parts; and ammonium chloride, one and one-half to three parts, together with a liquid from the group consisting of water and hydrogen peroxide, in quantity to make a thick paste.

Soldering Flux for Stainless Steel

Zinc Chloride	37 oz.
Acetic Acid	23 oz.
Hydrochloric Acid	40 oz.

Tin Plate Solder

Ammonium Chloride	4 oz.
Zinc Chloride	48 oz.
Hydrochloric Acid	1 oz.
Water	47 oz.

Dilute to required strength with water.

Crankshaft Heat Treatment

Shafts are heat treated in gas fired furnaces as follows:

Heat to 1650° F., hold for 20 minutes. Air quench to a minimum of 1200° F. Reheat to 1480° F., and hold 1 hour. Cool in the furnace to 1000° F. in another hour.

The alloy for casting is melted in four 15-ton electric furnaces according to the latest approved practice. The charge is made up of approximately 50 per cent return shop scrap (gates and risers) and 50 per cent steel scrap.

Drawhead Casting Heat Treatment

To obtain the best combination of mechanical properties, the castings are given a simple heat treatment, as follows:

Heat to about 1650° F., hold at heat 1 to 1½ hours per inch thickness of heaviest section, and cool in still air to a black heat. Reheat to 1200-1250° F., hold at least 1 hour per inch and cool in air or furnace. This treatment is not difficult and can be performed very readily with ordinary equipment. Usually the cost of such a treatment is no greater than that for simple annealing.

Oil Well Tool Heat Treatment

The heat treatment of these steels (used either for slip socket or tool joint) is quite similar. After forging it is advisable to anneal the steel to relieve any forging strains and at the same time put it in a readily machinable condition. One of the simplest treatments for doing this is to heat the steel to above 1600/1650° F. and cool in the furnace until black or, if removed from the furnace, pack in lime or ashes so that it cools slowly. The forging should then be machined and the final heat treatment performed as follows:

Heat to about 1550° F.; hold at this temperature until heated through thoroughly; quench in oil. The tempering operation will depend upon the hardness specifications. This steel is quite tough in the hardness range of 280/320 Brinell which could be secured by using a drawing temperature around 900° F., holding at this temperature until heated through thoroughly in the heavy sections. While final machining can be performed in this hardness range, it must be done very slowly, and it is desirable to use a lower hardness range, such as about 240/280 Brinell which is obtained with about 950° F. draw. The physical properties secured at these hardnesses is about as follows:

Tensile Strength	145,000 p.s.i.
Yield Point	120,000 p.s.i.
Elongation in 2″	18%
Reduction of Area	57%

For the slips a case hardened steel such as S.A.E. 2315 is used, arrangements to be made so that only the teeth are case hardened. This can be accomplished

by copper plating the piece before cutting the teeth so that the copper remains on all the parts except the teeth. Use a case hardening temperature of 1650/1700° F., cooling in the box and reheating the parts to a temperature of 1475° F., quenching in oil, and tempering by heating to 275-300° F. This treatment will toughen the core of the part so that it will be sufficiently hard not to stick or gall against the socket.

Heat Treatment of High Strength Shafting

Heat treatment for S.A.E. 3340: Oil quench from 1500° F. and temper at 800° to 900° F.

Heat treatment for Ni-Cr-Mo: Oil quench from 1575° F., temper at 900° to 1000° F.

Brake Drum Heat Treatment

The heat treatment given brake drums is heating to 1600° F., holding there for 30 min., then cooling rapidly in the furnace to 1450° F., followed by cooling in 2 hours to 1350° F. and then in 1 hour to 1000° F.

Valve Gear Metal Heat Treatment

A nickel-molybdenum case-hardening steel corresponding to S.A.E. composition 4615 is used. This material can be machined to the finished size in a soft state and then should be carburized by the pack method, at a temperature between 1650 and 1700° F., until a case about 1/32 in. in depth is secured. For the best results we would recommend quenching from the carburizing box into oil. This should be followed by a reheating to a temperature of 1375 to 1400° F. and quenching in oil, then temper at about 275° F. This treatment will result in a very hard case which should show excellent wearing properties.

Carburizing Nickel Steel

(1) A simple and economical treatment where refinement of the case is not important, is to carburize at 1600° F. and quench in oil directly from the box, followed by tempering at 250 to 350° F. (2) Or, if cooled in the box after carburizing, then heat to 1475–1500° F. and oil quench, then temper as above, to get a refined and tough core which will back up the hardness of the case. (This is not recommended if the carbon content of the core is over about .18%, as brittleness may result.)

(3) Cooling in the box, oil quenching from 1325 to 1375° F. and tempering, is recommended where a hard and refined case is the main requirement. (4) If refinement of both case and core is demanded, and economy and speed is not so important, a double treatment should be given, as follows: Carburize at 1600° F., cool in box. Quench in oil from 1500–1550° F., and again from 1325–1375°. Temper at 250–350° F. as required. This will give a very hard case and a ductile core, and is much used on gears of fine pitch.

Grinding Wheels

U. S. Patent 1,937,043

Carborundum 900 g., is mixed with furfuraldehyde 10 cc. till moist then with a phenolic resin 100 g., and the mixture is pressed into shape at less than 80° C. The articles are then heated at a suitable temperature until complete hardening occurs.

Aluminum Welding Flux

Potassium Chloride	79 oz.
Salt	16 oz.
Potassium Bisulphate	5 oz.

The above is best used with welding aluminum containing 4% silicon.

Bronze-Welding

Bronze-welding, as a general term for actual bronze-welding and for bronze-surfacing, is used today for joining metals of high melting points, as cast iron, steel, nickel, copper and their alloys, by the use of a bronze bonding material. For use with the oxy-acetylene flame, a rod of 59% copper, 40% zinc and 1% tin is generally used, while recently other elements as silicon, manganese, iron have been added. Lead is objectionable as it increases porosity of the weld metal.

Welding Rods for Copper, Steel and Bronze

U. S. Patent 2,009,977

Silicon	3.5 lb.
Tin	0.5 lb.
Phosphorus	0.05 lb.
Copper	96 lb.

Welding Zinc and Zinc Alloy Castings

The welding of zinc requires some care because of its low melting point and the tenacious character of the oxide. A gas flame should be used with welding rod of the same metal and a flux of ammonium chloride and water. The welding operation always weakens the surrounding

metal and should, if possible, be followed by a cold working operation to refine the grain.

Zinc alloy castings containing aluminum are extremely difficult to weld and the success of the operation depends largely on the technique of the welder.

Welding Electrode Coating
Canadian Patent 341,572
Formula No. 1

Shredded wood 100, sodium silicate 80, calcium carbonate 5, kaolin 5, silicomanganese 5 and peanut oil 5 parts. The coating in a plastic state is applied to the core and then baked or dried.

No. 2
U. S. Patent 1,968,984

Barium Chloride	20–50 lb.
Lithium Fluoride	4–6 lb.

To the above add 75–45% of following mixture.

Salt	40–50 lb.
Potassium Chloride	60–50 lb.

No. 3
U. S. Patent 2,000,861

Slip clay 40–60 parts, iron oxide 20–30 parts, calcium carbonate 20–30 parts, feldspar 15–30 parts, rutile 5–20 parts, manganese ore 5–15 parts, carbonaceous material 5–15 parts, ferromanganese 5–20 parts, ferrochrome 2–8 parts and dextrin 1–15 parts by weight.

Welding Rod for Bearing Metals
U. S. Patent 1,926,412

Zinc	90 lb.
Copper	5 lb.
Antimony	5 lb.

Welding Rod Coating
Formula No. 1
Canadian Patent 347,320

Calcium Carbonate	8 lb.
Barium Carbonate	9 lb.
Titanium Dioxide	22 lb.
Calcium Fluoride	11 lb.

Suspend above in sufficient of a solution of

Potassium Silicate	2 lb.
Water	1 lb.

No. 2
U. S. Patent 1,992,792

Titanium Dioxide	1 lb.
Talc	1 lb.
Feldspar	1 lb.
Sodium Silicate	3 lb.
Water	to suit

Aircraft Engine Alloys

Use case hardened 5% nickel steel (S.A.E. No. 2512) for aircraft engine gears. The crankshafts should be forged of a nickel-chromium steel such as S.A.E. 3240, or nickel-chromium-molybdenum steel of the following approximate composition:

Carbon	0.40–0.50 lb.
Manganese	0.45–0.75 lb.
Nickel	1.50–2.00 lb.
Chromium	0.60–0.90 lb.
Molybdenum	0.15–0.25 lb.
Iron	to make 100 lb

Heavy Duty Axle Alloy

Carbon	0.35–0.45 lb.
Nickel	1.50–2.00 lb.
Chromium	0.60–0.80 lb.
Manganese	0.60–0.80 lb.
Molybdenum	0.30–0.40 lb.
Iron	to make 100 lb.

Nickel Steel Pin and Bearing Alloy

5% nickel steel such as S.A.E. 2512, with the carbon at the upper end of the range, say 0.15% is used.

Carburize this steel at 1600–1650° F. The most suitable depth of case will depend upon the dimensions of the pin, and normally should not be more than 15% of its diameter. The cooling after carburizing should preferably be done in the box, but it is recommended that it be as rapid as convenient, such as allowing the box to cool in free air or possibly in an air blast.

For the hardening operation a single quench would be advisable at a temperature just high enough to refine the core. On these small pieces a temperature around 1440–1450° F. would be sufficient. The tempering operation on this steel should be at 275° F. The complete treatment will give maximum core strength, combined with very good toughness.

Hard Tool Steel Alloys
Japanese Patent 101,748

Mold following under high pressure at 1600–1800° C.

Formula No. 1

Vanadium Powder	5 lb.
Tungsten Carbide	95 lb.

No. 2

Titanium Powder	5 lb.
Tungsten Carbide	95 lb.

No. 3

Vanadium	3 lb.
Titanium	2 lb.
Tungsten Carbide	95 lb.

Steering Knuckle and Spring Bolt Alloy

A case hardened steel of the following composition is used.

Carbon	0.12–0.20 lb.
Manganese	0.30–0.60 lb.
Nickel	3.25–3.75 lb.
Molybdenum	0.20–0.30 lb.
Iron	to make 100 lb.

Punch and Die Alloys

Use steels containing

Carbon	0.6–0.65 lb.	0.6–0.65 lb.
Manganese	0.3–0.6 lb.	0.3–0.6 lb.
Nickel	1.5–2 lb.	1.5–2 lb.
Chromium	0.9–1.25 lb.	0.6–0.8 lb.
Molybdenum	—	0.2–0.4 lb.
Iron		to make 100 lb.

It should be thoroughly annealed after forging as follows: Heat to 1550/1575° F., air-cool, reheat to 1200/1250° F., hold for 6 to 8 hours and cool very slowly. To harden, heat to 1425° F., quench in oil, and temper for 1 hour at 425/450° F.

Shovel Dipper Teeth Alloy

Carbon	0.4–0.50 lb.
Nickel	3.0–3.50 lb.
Chromium	1.0–1.25 lb.
Molybdenum	0.3–0.40 lb.
Iron	to make 100 lb.

Heat treatment:

Heat to 1750° F., hold 1½ hours per inch thickness; air cool. Reheat to 1250° F., hold at least one-hour per inch thickness; cool in air or furnace. Some foundries furnish the teeth in this condition, while others claim better wear by giving the tips a second treatment for hardening. This is done by heating the point or tip to a distance of 2 in. or 3 in. (dependent upon the size and shape of the tooth), to a red heat (1500–1800° F.) and cooling rapidly with an air blast. If it is found that the points are too brittle the whole tooth may be drawn at 700–800° F. Sometimes this tip hardening treatment is given to the castings after a plain annealing of the whole tooth, thus eliminating original air-quenching and drawing treatment described at the beginning of this paragraph.

Another steel used quite successfully for shovel teeth in this service is the following:

Carbon	0.40–0.5 lb.
Nickel	1.75–2.0 lb.
Chromium	0.70–0.9 lb.
Iron	to make 100 lb.

These castings are given either an annealing or air quenching treatment as described above for the nickel-chromium-molybdenum steel. The tips are then reheated to a red heat and quenched in oil. The whole casting is then drawn at 700–900° F., depending upon the hardness required.

A steel which is giving excellent service in castings subjected to wear, has the following composition:

Carbon	0.35–0.45 lb.
Manganese	1.25–1.50 lb.
Nickel	2.25–2.50 lb.
Iron	to make 100 lb.

Acid Resisting Alloy

Patented

Molybdenum	0.5–10 lb.
Tin	4–5 lb.
Lead	95.5–85 lb.

Antifriction Alloy

British Patent 413,209

Copper	67.5 lb.
Lead	25 lb.
Tin	5 lb.
Nickel	1 lb.
Antimony	0.5 lb.
Cadmium	0.5 lb.
Zinc	0.5 lb.

Hard Aluminum Alloy

British Patent 406,161

Aluminum	89 –94 lb.
Magnesium	1.5 lb.
Copper	3.7– 5.5 lb.
Nickel	0.2– 1 lb.
Silicon	0.2– 1 lb.
Manganese	0.4– 2 lb.

Aluminum Alloy for Chill Casting

U. S. Patent 1,997,494

Aluminum	75 –95 lb.
Iron	2 –10 lb.
Antimony	0.5–15 lb.
Magnesium	0.2– 0.4 lb.

Oxidizing Nickel Silver

Hydrochloric Acid	1	gal.
White Arsenic	10	oz.
Copper Sulphate	10	oz.
Ferric Chloride	2	oz.
Copper Acetate	2	oz.
Ammonium Chloride	1	oz.
Hyposulphate of Soda	1½	oz.

Heat the hydrochloric acid, and when hot put in the white arsenic. When the white arsenic is completely dissolved, mix in the balance of the formula.

It must be definitely understood that this solution can only be used while cold. The article can be placed in a plater's basket or wired and dipped possibly half a dozen times in the solution, rinsed in cold water and then dipped in a solution of sodium cyanide and then rinsed again in cold water. After this rinse, the article should again be dipped in the oxidizing solution and the process is then complete.

The result should be a jet black oxide which can be scratch brushed if a solid black is desired, and can be readily spotted off for highlights.

Copper Alloy Resistant to Sea Water
U. S. Patent 1,956,251

Silicon	1 – 3.25 lb.
Tin	0.5 – 1.5 lb.
Iron	0.75– 1.27 lb.
Lead	0 – 2 lb.
Copper	97.75–93.98 lb.

Copper Alloy Spot Welding Electrode
U. S. Patent 1,957,214

Electrodes are tipped with following:

Cobalt	2.6 lb.
Beryllium	0.4 lb.
Copper	97 lb.

Cold Working Copper Alloy
U. S. Patent 1,936,397

Silicon	0.75 lb.
Manganese	0.25 lb.

Non-Staining Copper Alloy
U. S. Patent 2,007,430

Nickel	1 to 5 lb.
Cobalt	0.25 to 2 lb.
Silicon	0.25 to 2 lb.
Aluminum	1 to 5 lb.
Molybdenum	0.25 to 3 lb.
Iron	0.10 to 1 lb.
Calcium	0.05 to 0.5 lb.

Copper of an amount to complete a 100 lb. mass.

High Melting Copper Alloy
German Patent 597,938

Beryllium	0.3–10 lb.
Aluminum	0.5–12 lb.
Copper	99.2–88 lb.

Low Cost Dental Alloy

Silver	85 oz.
Gold	10 oz.
Palladium	5 oz.

Cheap Dental Inlay Alloy

Copper	19.29 lb.
Silver	79.29 lb.
Zinc	0.71 lb.
Tin	0.71 lb.

Cast Denture Alloy
Canadian Patent 342,946

Chromium	17.5 lb.
Cobalt	57 lb.
Tungsten	3 lb.
Nickel	21 lb.
Iron	1 lb.
Carbon	0.5 lb.

Dental Alloy
French Patent 43,121

Gold	20–15 oz.
Copper	3–12 oz.
Silver	65–63 oz.
Zinc	7–8 oz.

Dental Filling Alloy
German Patent 603,456

Bismuth	62.5 g.
Tin	37.2 g.
Gallium	1.3 g.

Dental Alloy Casting Mold
British Patent 412,303

Plaster of Paris	40 lb.
Cristobalite	45 lb.
Tridymite	10 lb.
Quartz	5 lb.

Dental and Jewelry Alloy
U. S. Patent 1,965,012

Gold	5–15 oz.
Palladium	22–30 oz.
Silver	37–50 oz.
Copper	10–20 oz.
Indium	0.5–5 oz.

Imitation Gold Alloy
French Patent 776,806

Copper	80–82 g.
Zinc	11–15 g.
Tin	3–5 g.
Nickel	2 g.

During fusion add the following per 100 g. of alloy.

Cream of Tartar	9 g.
Magnesium Oxide	6 g.
Ammonium Chloride	3.5 g.
Lime	1.5 g.

Lead Calcium Alloys
British Patent 412,316

Lead and pea size pieces of calcium carbide are mixed at 650–700° C. in presence of fused slag consisting of salt, calcium chloride and calcium fluoride. Alloys containing 3–3.5% calcium are obtained in 8 to 10 hours.

Lead Storage Battery Alloy
British Patent 411,524

Tellurium	0.05 lb.
Antimony	6 lb.
Lead	93.95 lb.

Non-Corrosive Magnesium Alloy
German Patent 613,511

Zinc	1–10 lb.
Iron	0.02–1 lb.
Silver	0.05–3 lb.
Magnesium	98.93–86 lb.

Radium Beam Therapy Alloy

Nickel	5 lb.
Copper	5 lb.
Tungsten	90 lb.

Sinter the powdered metals at 1250–1350° C.

Arc-Light Reflector Alloy
German Patent 615,119

Cobalt or Nickel	20–60 lb.
Tungsten or Molybdenum	15–50 lb.
Chromium	30–40 lb.
Carbon or Silicon	1–5 lb.

Electric Light Reflector Alloy
British Patent 412,074

Aluminum	60 lb.
Silver	25 lb.
Magnesium	15 lb.

Mirrors of Silver-Copper Alloy
Canadian Patent 348,131

Prepare solution No. 1 by adding to 16 oz. of silver nitrate, 11 oz. of ammonia (26°) and, after the solution is complete, 16 oz. of distilled water; cool, filter and add to the filtered solution an additional 144 oz. of distilled water.

Prepare solution No. 2 by dissolving 1 lb. crystallin copper sulphate in 64 oz. of distilled water, filter and place in a dark bottle.

For solution No. 3, to 64 oz. of distilled water add 2 lb. of crystallin Rochelle salt, heat to boiling and add 1 oz. of silver nitrate dissolved in 4 oz. of distilled water. To this mixture at the boiling point add 4 oz. of solution No. 2 and boil for at least 10 minutes; then cool, filter and place the filtered solution in a dark bottle.

For solution No. 4, dissolve 1 lb. of powdered tartaric acid in 48 oz. of distilled water, let stand 1 week and filter.

Prepare the final solution from distilled water, 64 oz.; solution No. 1, 2 oz.; solution No. 3, 2 oz.; and solution No. 4, 3 dr. Polish and brush with water the glass that is to be coated; then apply a weak solution of tin chloride with a felt block or bristle brush, rinse with water and lightly brush. Treat the surface with the final solution, and when the first coating of silver-copper alloy is deposited brush well to obtain a clean metallic surface. A second coating of the alloy may be applied and similarly polished. Apply a coating of shellac to the dried coated surface and then cover with paint.

Galena Blue Mirror (Non-Glaring)
U. S. Patent 1,988,663

Solution No. 1

Lead Nitrate	2 oz.
Distilled Water	32 oz.

No. 2

Potassium Hydroxide, Sodium Hydroxide or Other Similar Alkali Agent	4 oz.
Distilled Water	32 oz.

No. 3

Thiourea (Thiocarbamide)	2 oz.
Distilled Water	48 oz.

In preparing the above solutions care must be taken to insure complete dissolution of the chemicals and each solution should be shaked well before using. In order to produce a lead sulphide film or layer upon the glass or other surface to be treated either of two processes may be employed, one being designated as the "hot" process and the other as the "cold" process.

In either process, the glass or other surface to be coated is initially block

polished or hand rubbed with rouge, after which it is well brushed with water. Following this water brushing operation, a weak solution of tin chloride is applied to the surface to be treated preferably by means of a felt block or bristle brush. The surface is then rinsed well with water and lightly brushed.

The glass so treated is then placed in a horizontal plane and accurately leveled with wedges, the surface to be coated being uppermost. In the "hot" process, after the glass has been initially treated, washed and leveled as just described, the following Solution No. 4 is poured upon the surface to be coated:

No. 4

Distilled Water	4 oz.
Solution No. 1	1 oz.
Solution No. 2	1 oz.
Solution No. 3	1 oz.

Attention is here directed to the fact that in preparing Solution No. 4, the numbered solutions are added to the distilled water in the order given above and that Solution No. 3 is not added until just before the final solution is to be poured upon the glass. Following the application of the tin chloride solution the surface to be treated must be kept wet until the final solution has been applied thereto. As much of the final Solution No. 4 is poured upon the leveled surface as the latter will hold without the solution running over the edges. Heat is uniformly applied to the glass preferably by placing the glass upon a table or bed the surface of which is heated to the required temperature.

In a relatively short time (about 15 minutes) lead sulphide will have deposited out of the final solution and upon the glass. The excess solution is then removed from the glass surface, preferably with a piece of chamois, after which the deposited film is well wiped to obtain a clean metallic surface. A second application of the final Solution No. 4 is then made. In about 10 minutes a second coating or film of lead sulphide will have deposited out of solution upon the first coating, the second coating being also wiped and dried with the chamois. When deposited film of metal shows no dark spots indicating the presence of moisture, a coating of shellac is applied followed by a coating of paint, if desired.

Lead sulphide or galena is a strong metal and adheres tenaciously to the glass. If the mirror shows a grayish color it is usually due to an insufficiently heavy coating of the deposited metal. An additional coating will remove this defect.

In carrying out the "cold" process, the application of heat is of course omitted and in preparing the final solution no additional distilled water is employed. In other words, the final solution for use in the "cold" process is prepared as follows:

Solution No. 1	1 oz.
Solution No. 2	1 oz.
Solution No. 3	1 oz.

This final "cold" solution is prepared by adding one part of Solution No. 2 to one part of Solution No. 1. These are thoroughly mixed and allowed to stand for about 15 minutes, after which one part of Solution No. 3 is added. After Solution No. 3 has been added, it is necessary to immediately pour the final solution upon the glass due to the fact that the metal tends to deposit out of solution quite rapidly.

Both the hot and cold processes as hereinbefore described have been found quite effective in the application of a firm and homogeneous film or coating of metallic lead sulphide upon a glass surface or the like, it being of course understood that this lead sulphide is formed by the combination of the sulphur present in Solution No. 3 with the lead present in Solution No. 1. It will be understood that in both the hot and cold processes the thickness of the deposited film or coating may be reduced as desired by introducing additional quantities of distilled water either to the final solution or to the primary solutions.

It is important to note that while galena blue (lead sulphide) will not work or combine with silver it will combine with gold.

Aluminum Mirrors

British Patent 433,484

A highly polished aluminum sheet is treated anodically in 2½% borofluoric acid using 20 amp. per sq. ft. at 31 to 33° C., washed and then anodically oxidized in 7% sulphuric acid at 25–26° C. using 12 amp. per sq. ft. After drying, buff with polishing cream.

Silvering Mirrors

a. Silver Nitrate	6 g.
Water	75 cc.
Ammonia (28%)	sufficient

Dissolve silver nitrate in water and add sufficient ammonia water to dissolve the precipitate initially formed.

b. Glucose	10 g.
Water	100 cc.

Mix equal parts of *a* and *b* and heat slowly on a steam bath (or in hot water) in the vessel or on the object to be mirrored.

Colored Mirrors

One may use one of two processes to obtain a colored reflecting surface. One process consists of deposition of gold in various thicknesses. The resultant effect of this process is a gold or yellowish to brown colored mirror. This process is limited to a very narrow range of these colors.

A more satisfactory and more widely used process is one where colored glass is used. Pink, red, yellow, purple, green or any desired shade or color glass is used on which silver is precipitated by the regular silvering precipitation process. The silver is then backed on in a normal manner. The resultant effect is a very beautifully colored mirror which is as permanent as the silvering itself. The glass generally used for this purpose is imported.

Of course, one could use a modification of this colored glass process by spraying or brushing on to the front surface of clear glass a colored transparent coating made up of gum sandarac or similar resin in alcohol and dyed to the proper shade. The back of the glass is then silvered in the normal orthodox method. This type of colored mirror is limited in its life by the durability of the front finish coat. It is also very difficult to obtain a uniform smooth reflecting surface by painting or spraying a finish for during the drying period an orange peel effect may manifest itself on the surface and a wavy condition result.

Matte Silver Finish on Watch Dials

Formula No. 1

First clean the article well of oil, grease, etc. Then dip into the following solution:

Sodium Dichromate	4 oz.
Concentrated Sulphuric Acid	12 oz.
Water	1 gal.

The time of dipping depends on the appearance ultimately desired and must therefore be determined by experiment. Rinse well in water, and silver plate in following:

Silver Cyanide	3.5	oz. troy
Sodium Cyanide	4	oz. avoir.
Sodium Carbonate at least	6	oz. avoir.
Water	1	gal.

Finally soak in boiling water to give dead white color.

No. 2

Precipitated silver is used on some types of high grade watch dials where a dead white matte finish is desired. A raised grain effect is obtained at the same time. The following formula can be employed, using precipitated silver:

Precipitated Silver	1 oz.
Cream of Tartar	2 oz.
Sodium Chloride	2 oz.

Mix dry, add enough water to make thick paste. Apply by running with stiff brush. The proportions may be varied depending upon grain and matte desired. The best results are obtained on alloys rich in copper such as gilding metal.

Sulphur Resisting Alloy

German Patent 591,641

Nickel	44 to 79 lb.
Chromium	9 to 31 lb.
Aluminum	at least 9 lb.
Silicon	at least 2 lb.

And 0–14% of one or more of the following: Iron, Molybdenum, Copper, Manganese, Carbon.

Alloys for "Tin" Buttons

Lead	16 g.
Antimony	16 g.
Tin	8 g.

Electrical Resistance Wire Alloy

U. S. Patent 1,926,213

Gold	58.4 oz.
Nickel	41.6 oz.

Heat Treatment of Aluminum Magnesium Silicon Alloy

Anneal for 1 to 3 hours at 500–550° C.; quench in oil or water and temper at 180–250° C. for 1½ to 3 hours.

Corrosion and Heat Resisting Alloy

35% nickel, 15% chromium (balance iron). This material shows very good resistance to oxidation and corrosion at temperatures up to 2000° F., and still retains an appreciable amount of strength.

Improving Babbitt Metal

Babbitt flow characteristics are greatly improved by adding a small amount of rosin to the molten mass.

Zinc Die Casting Alloys

The following zinc die casting alloys are characterized by low metal cost, ease of casting, excellent finish, good resistance to corrosion, permanence of dimensions, and high strength. The percentage limits apply to die castings. Ingot specifications should be narrower.

U. S. Patent 1,596,761
Zamak-2—A.S.T.M. Alloy XXI—S.A.E. Alloy 921

(The name Zamak is trade marked.)

Aluminum	3.5 –4.5%
Copper	2.5 –3.5%
Magnesium	0.02–0.1%
Iron	0.1 % maximum
Cadmium	0.005% maximum
Lead	0.007% maximum
Tin	0.005% maximum
Zinc (Special High Grade — 99.99% Pure)	remainder

This alloy is outstanding in hardness, tensile strength, and resistance to corrosion under severe atmospheric exposure conditions.

U. S. Patent 1,779,525
Zamak-3—A.S.T.M. Alloy XXIII—S.A.E. Alloy 903

Aluminum	3.5 –4.3 %
Copper	0.1 % maximum
Magnesium	0.03–0.08%
Iron	0.1 % maximum
Lead	0.007% maximum
Cadmium	0.005% maximum
Tin	0.005% maximum
Zinc (Special High Grade — 99.99% Pure)	remainder

This alloy is distinguished by excellent retention of impact strength and dimensions.

U. S. Patent 1,852,441
Zamak-5

Aluminum	3.5 –4.5 %
Copper	0.75–1.25%
Magnesium	0.02–0.08%
Iron	0.1 % maximum
Lead	0.007 % maximum
Cadmium	0.005 % maximum
Tin	0.0015% maximum
Zinc (Special High Grade — 99.99% Pure)	remainder

The characteristics of this alloy are excellent resistance to corrosion combined with nearly as high strength as Zamak-2 and retention of dimensions nearly equal to Zamak-3.

U. S. Patent Re 18,600
Zamak-6

Aluminum	3.5–4.5%
Copper	1.0–1.5%
Magnesium	0.01 % maximum
Iron	0.1 % maximum
Lead	0.007% maximum
Cadmium	0.005% maximum
Tin	0.005% maximum
Zinc (Special High Grade — 99.99% Pure)	remainder

This alloy offers maximum ease of casting at the expense of maximum resistance to intercrystalline oxidation.

Zinc Slush Casting Alloys

The zinc slush casting alloys offer a desirable combination of high strength, good casting finish, ease of application of plated and other finishes with low metal cost.

Formula No. 1

Zinc (Special High Grade—99.99% Pure).

This metal offers ease of casting and good permanence but lower strength than Formulas No. 2 and No. 3.

No. 2

Aluminum	5–6%
Zinc (Special High Grade—99.99% Pure)	remainder

This alloy offers the greatest ease of casting and high initial strength but poor permanence.

No. 3

U. S. Patent Re 18,600

Aluminum	4.55–4.95%
Copper	0.65–0.85%
Zinc (Special High Grade —99.99% Pure)	remainder

This alloy is somewhat hard to cast but has good retention of physical properties and high strength.

No. 4

U. S. Patent 1,596,761

Aluminum	5.5 –6.5%
Copper	2.5 –3.5%
Magnesium	0.02–0.1%
Iron	0.1 % maximum
Lead	0.007% maximum
Cadmium	0.005% maximum
Tin	0.005% maximum
Zinc (Special High Grade — 99.99% Pure)	remainder

This alloy offers the highest strength

and permanence of the zinc base slush casting alloys but is also the most difficult to cast.

Zinc Alloy Solders

Formula No. 1

Cadmium	82.5%
Zinc	17.5%
Melting Point	508° F.

This solder is most advantageously used in soldering zinc alloy castings containing aluminum. No flux is necessary.

Note: In making this solder, solid cadmium should be added to molten zinc since cadmium fumes have a very dangerous toxic effect. If the cadmium be melted separately, the temperature should not be allowed to rise above 660–700° F. and the surface of the molten metal should be treated with a flux of ammonium chloride.

U. S. Patent 1,988,010

Percentage by Weight

Composition	Tin	Zinc	Cadmium	Freezing Point ° F.
Formula No. 1	20	53	27	617
No. 2	20	48	32	604
No. 3	30	53	17	630
No. 4	30	46	24	599
No. 5	30	42	28	595
No. 6	40	36	24	581

The above solders are used principally for soldering aluminum and aluminum base alloys. They may be used with or without fluxes depending on the cleanliness of the metal parts.

Cleaning of Zinc and Zinc Alloys

The successful application of plated and other coatings to zinc, zinc alloy die castings, and zinc alloy slush castings depends largely on the suitability and effectiveness of the method of cleaning used.

Cleaning may be accomplished by any one of three methods: (1) Mechanical cleaning by means of sandblasting or scratch brushing, (2) alkaline cleaning and (3) solvent cleaning.

Mechanical Cleaning

Sandblasting with 80 to 100 mesh abrasive is probably most effective since it simultaneously removes grease and dirt and roughens the surface of the metal.

Alkaline Cleaning

Alkaline cleaning has been accomplished very effectively by the use of trisodium phosphate in concentration of 6 oz. per gal. of water. This solution when used at or near the boiling temperature and with sufficient current from a 6-volt source to cause violent gassing with the work as the cathode, should remove all grease and oil in ½ to 2 minutes. Alternate hot and cold rinses followed by a brief immersion in 10% hydrochloric acid and a final rinse in hot water to facilitate drying will effectively remove the film of alkaline cleaning salts and present a surface suitable for plating or other finishes.

Soldering Zinc and Zinc Alloy Castings

Zinc may be soldered easily, using ordinary solder and a flux consisting of acidulated zinc chloride or killed muriatic (hydrochloric) acid.

Zinc alloys containing aluminum are quite difficult to solder, requiring the use of a solder consisting of the cadmium-zinc eutectic (82.5% cadmium—17.5% zinc—melting point 508° F.).

Machining Zinc and Zinc Alloy Castings

Both rolled zinc and zinc alloy castings are machined most advantageously by using tools with more rake than is customary in machining other common metals. The cutting tool should have 15–20° rake and 6–8° clearance.

Two-fluted drills with spiral angles about twice the usual 24 degrees are satisfactory. The included angle of the cutting edges may be advantageously reduced. The clearance angle should be 15 degrees at the periphery of the drill and gradually increased still further as the drill point is approached. Beveling off the end of the flute back of each cutting edge provides more chip clearance for rapid work.

Soapy water is ordinarily a satisfactory lubricant. Kerosene may be used as a lubricant to insure satisfactory separation of chips.

Low Temperature Glaze for Art Ware and Enameled Brick

White Lead	35 lb.
Feldspar	17 lb.
Flint	20 lb.
Whiting	8 lb.
China Clay	8 lb.
Colemanite	12 lb.
Tin Oxide	5 lb.

Matte Glaze—Cone 06 to Cone 02:

White Lead	490 lb.
Whiting	138 lb.
Cornwall Stone	114 lb.
China Clay	210 lb.
Feldspar	98 lb.
Flint	60 lb.

For light green use 2 to 3% copper oxide; for light brown 2% manganese dioxide; for blue 1% cobalt oxide; for yellow 2% sodium uranate; for yellow brown ½ to 2% Crocus Martis.

Atware Satin Glaze—Cone 04:

White Lead	410 lb.
Flint	227 lb.
Feldspar	85 lb.
Zinc Oxide	90 lb.
Tin Oxide	60 lb.
Barium Carbonate	42 lb.
Titanium Dioxide	32 lb.
China Clay	54 lb.

Green Matte Glaze—Cone 2:

Red Lead	165 lb.
Feldspar	222 lb.
Whiting	40 lb.
Zinc Oxide	32 lb.
Copper Oxide	12 lb.
Calcined Georgia Kaolin	55 lb.
English Ball Clay	64 lb.

This gives a good wax-like texture green for artware or enameled brick.

Vitreous Enameling Process
British Patent 411,380

A mixture of spinel-forming materials, e.g., water 100, ferric oxide 5, nickel oxide 4, calcium fluoride 20, boric acid 45, clay 10 parts, is applied to the iron surface (not necessarily free from rust) and heated at 750–800° for a few minutes in an atmosphere of reduced oxygen content (admixture of producer or waste gases, etc.).

White Vitreous Enamel
U. S. Patent 1,933,437

A white enamel for sheet iron and hollow-ware comprises flint 29.236, borax 13.127, sodium nitrate 5.727, sodium carbonate 10.740, red lead 14.920, barium carbonate 7.757, calcium fluoride 6.563, antimony oxide 4.773, and sodium antimonate 7.160%.

Spark Plugs
French Patent 772,601

A ceramic product for spark plugs is composed of a difficultly fusible oxide, e.g., corundum, and a binder which during thermal expansion behaves elastically toward the oxide used. The binder should become plastic at 500–800° C. An example of a binder for use with corundum contains steatite or talc 32.7, kaolin 43.3 and feldspar 24 parts by weight.

Synthetic Precious Stones (Spinels)
U. S. Patent 1,952,255

(*a*) Artificial alexandrite is made by fusing aluminum oxide 85 and magnesium oxide 15% containing cobalt 0.06, iron 0.04%, and vanadium 0.04%, and (*b*) a violet spinel by fusing the same aluminum oxide-magnesium oxide mixture with iron 1.5 and cobalt 0.005%.

Corundum Abrasive Crystals
U. S. Patent 1,966,406

A mixture of raw materials is prepared consisting of aluminous ore such as bauxite or diaspore, silica sand, and an addition agent such as magnesia so proportioned as to give the following ratio of important ingredients:

Alumina	70 lb.
Silica	25 lb.
Magnesia	5 lb.

This mixture may be fused in an electric furnace of the steel shell arc type commonly used in the artificial abrasive industry. The ratio of power input to application of the mix is observed closely as means of governing the temperature of the melt. Thus, under any given rate of power input, a fast feed produces a relatively cool melt, whereas a retarded feed tends to produce a relatively hot bath. The temperature of the melt at the time of withdrawal of the power determines the size and distribution of the corundum crystals. The cool melt produces small crystals uniformly spread through the matrix whereas the hot melt gives rise to the development of large crystals, in pocket formation in the mass.

After the shell has been charged to its capacity and the fusion is completed the electrodes are withdrawn and the cooling process allowed to proceed normally.

Brick Glazing

White Enamel Batch Weights

Red Lead	125.4
Whiting	35
No. 419 Feldspar	66.1
Raw Kaolin	12.9
Calcined Kaolin	6.7
Flint	40
Tin Oxide	30

Black Enamel

To the above base enamel batch, without the tin oxide, the following is added:

Cobalt Oxide (CoO)	6
Iron Oxide (Fe_2O_3)	8
Manganese Dioxide (MnO_2)	2

Blue Enamel

Batch weights of base enamel:

Buckingham Spar	66.32
Red Lead	120.84
Whiting	36
Tin Oxide	57.77
Raw Clay (Kaolin)	12.9
French Flint	40.34
Calcined Kaolin	11.22

To the above base is added:

Black Oxide of Copper	12
Black Oxide of Cobalt	18
Black Oxide of Nickel	6

Brown Enamel

To the above base is added:

Red Oxide of Iron (Fe_2O_3) 16

The production of other colors is merely a matter of experiment with the addition of coloring oxides.

These glazes contain tin oxide as an opacifier and on a smooth body develop a glossy enamel of sufficient weight to perfectly mask the red of the shale brick.

Slips

95% Tennessee Ball Clay (for white slip use English Ball Clay).

5% Sodium Chloride are of simple materials and easily made up.

For green slip add 20% Chromium Oxide (Cr_2O_3) to the above base. The batch then is:

Cone 02 to Cone 2

Clay	380
Sodium Chloride	20
Chromium Oxide	80

For blue slip, add 6% Cobalt Oxide to base. Batch:

Clay	380
Sodium Chloride	20
Cobalt Oxide	24

Stone Waterproofing

An economical treatment that is very durable may be made by dissolving from 6 to 12 oz. of a high-melting-point paraffin to the gallon of solvent, such as mineral spirits, naphtha, gasoline, etc. This usually gives high waterproofing values on materials of medium to coarse textures. For fine-pore structures it will be desirable to add from 3 to 6 oz. of china wood oil to the gallon of gasoline.

Stucco Waterproofing

U. S. Patent 1,942,601

Sodium Stearate	5 lb.
Water	95 lb.

Warm to 50° C. and stir till uniform, then add

Suet	2 lb.
Cresol Emulsion	¼ oz.

Masonry Waterproofing

British Patent 413,463

Spermaceti	4 lb.
Paraffin Wax	1 lb.
Rubber	1 lb.
Mineral Spirits	25–50 lb.
Trichloroethylene	25–50 lb.

Stir until dissolved.

Vitreous Slips for Brick, Terra Cotta and Roofing Tile

Buff	
Fireclay	130 lb.
Shale	100 lb.
White Lead	40 lb.
Blue	
Ball Clay	200 lb.
Cobalt Oxide	9 lb.
Manganese Dioxide	6 lb.
White Lead	50 lb.
Green	
Ball Clay	200 lb.
White Lead	50 lb.
Chrome Oxide	40 lb.
Manganese Dioxide	24 lb.
Cobalt Oxide	5 lb.
Black	
Ball Clay	60 lb.
Blackbird Clay	140 lb.
White Lead	30 lb.

Mix the above materials with sufficient water to make a heavy slip, and apply either by spraying or brushing on the dry body, then fire.

CERAMIC RAW MATERIALS

Chemical Constants

Material	Formula	Molecular Weight	Equivalent Weight	Melting Point Deg. C.	Per Cent Smelt Loss
Aluminum Hydroxide	$Al_2(OH)_6$	156	— 156	—	34.6
Aluminum Sulphate	$Al_2(SO_4)_3$	342.1	R_2O_3 342.1	D770	—
Antimony Oxide	Sb_2O_3	291.5	R_2O_3 291.5	red heat	—
Arsenic Oxide	As_2O_5	197.8	R_2O_3 197.8	200	—
Barium Carbonate	$BaCO_3$	197.4	RO 197.4 RO_2 197.4	D900, M1360	22.3
Bismuth Oxide	Bi_2O_3	466	R_2O_3 466	820–860	—
Black Needle Antimony	Sb_2S_3	339.7	R_2O_3 339.7	550	—
Bone Ash	$Ca_3(PO_4)_2$	310	RO 103	—	—
Bone Ash	$4Ca_3(PO_4)_2 \cdot CaCO_3$	1340	— —	—	—
Borax	$Na_2B_4O_7 \cdot 10H_2O$	381.2	RO 381.2 R_2O_3 190.6	—	—
Borax (Melted)	$Na_2B_4O_7$	201.3	RO 201.3 R_2O_3 100.6	732	—
Boric Oxide	B_2O_3	69.6	R_2O_3 69.6	577	—
Cadmium Carbonate	$CdCO_3$	172.4	— 172.4	—	25.5
Cadmium Oxide	CdO	128.4	— 128.4	above 1426	—
Cadmium Sulphide	CdS	144.4	— 144.4	—	—
Calcium Carbonate	$CaCO_3$	100.1	RO 100.1	D825	44
Chromium Oxide	Cr_2O_3	152	— 152	1990	—
Clay (China)	$Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$	258.1	R_2O_3 258.1 RO_2 128.6	—	14
Cobalt Carbonate	$CoCO_3$	118.9	RO 118.9 R_2O_3 237.8	D	37
Cobalt Chloride	$CoCl_2 \cdot 6H_2O$	238	238	86.75	68.4
Cobalt Nitrate	$Co(NO_3)_2 \cdot 6H_2O$	291.1	RO 291.1 R_2O_3 582.2	56	74.3
Cobalt Sulphate	$CoSO_4 \cdot 7H_2O$	281.1	RO 281.1 R_2O_3 562.2	96.8	73.3
Cobaltous Oxide	CoO	75	—	—	—
Copper Carbonate	$CuCO_3$	124	— 124	—	35.5
Copper Oxide (Cupric)	CuO	79.6	— 79.6	1235	—
Copper Sulphate	$CuSO_4$	160	— 160	—	—
Feldspar (Potassium)	$K_2O \cdot Al_2O_3 \cdot 6SiO_2$	556.8 RO 556.8	R_2O_3 556.8 RO_2 92.9	—	—
Feldspar (Sodium)	$Na_2O \cdot Al_2O_3 \cdot 6SiO_2$	524.5 RO 524.5	R_2O_3 524.5 RO_2 87.6	—	—
Fluorspar	CaF_2	78.1	RO 78.1	—	—
Iron Oxide (Ferric Oxide)	Fe_2O_3	159.7	— —	—	—
Iron Sulphate	$FeSO_4 \cdot 7H_2O$	278	— —	—	71.6
Lead Chromate	$PbCrO_4$	323	$RO \cdot 5R_2O_3$ 323 $2RO \cdot R_2O_3$ 646	—	—

Litharge	PbO	223.2	—		—	—	—
Lithium Carbonate	Li_2CO_3	73.9	RO		73.9	618–710	59.4
Manganese Dioxide	MnO_2	86.9	RO		86.9	$O_2$535	18.4
Manganous Chloride	$MnCl_2 \cdot 4H_2O$	197.9	—		197.9	650	$H_2O = 36.4$
Magnesium Carbonate (Magnesite)	$MgCO_3$	84.3	RO		84.3	D350	52.1
Magnesium Oxide	MgO	40.3	RO		40.3	2800	—
Magnesium Sulphate	$MgSO_4 \cdot 7H_2O$	246.5	RO		246.5	—	83.8
Nickel Sulphate	$NiSO_4 \cdot 7H_2O$	280.9	—		280.9	—	$H_2O = 44.9$
Nickelous Oxide	NiO	74.7	RO		74.7	$O_2$400	—
Potassium Carbonate	K_2CO_3	138	—		138	896	31.8
Potassium Dichromate	$K_2Cr_2O_7$	294.2	RO 294.2 R_2O_3 294.2	RO_3	147.1	397.5	16.3
Potassium Hydroxide	KOH	56.1	RO		112.2	360.4	16.1
Potassium Nitrate	KNO_3	101.1	RO		202.2	337	53.4
Red Lead	Pb_3O_4	685.6	RO		228.5	D500	2.3
Selenium	Se_8	633.6	RO_2		79.2	688	—
Silica (Flint)	SiO_2	60.1	RO		60.1	1600–1750	—
Sodium Antimonate	$2NaSbO_3 \cdot 7H_2O$	511.6	—		511.6	—	24.6
Sodium Carbonate (Crystal)	$Na_2CO_3 \cdot 10H_2O$	286	—		286	—	—
Sodium Carbonate (Fused)	Na_2CO_3	106	—		106	849	41.5
Sodium Dichromate	$Na_2Cr_2O_7 \cdot 2H_2O$	298	—		298	—	12.1
Sodium Nitrate	$NaNO_3$	85	—		85	310	63.5
Sodium Silico Fluoride	Na_2SiF_6	188	—		188	—	—
Sodium Sulphate	$Na_2SO_4 \cdot 10H_2O$	322.2	—		322.2	32	$H_2O = 55.9$
Sodium Uranate	Na_2UO_4	348.2	RO		348.2	—	—
Strontium Carbonate	$SrCO_3$	147.6	RO		147.6	D1075	29.8
Talc	$3MgO \cdot 4SiO_2 \cdot H_2O$	379.3	RO 126.4	RO_2	94.8	—	—
Tin Oxide (Stannic)	SnO_2	150.7	RO_2		150.7	1127	—
Titanium Oxide	TiO_2	80.1	RO_2		80.1	1560	—
White Lead	$2PbCO_3 \cdot Pb(OH)_2$	775.6	RO		258.5	D	13.7
Zinc Oxide	ZnO	81.4	RO		81.4	—	—
Zirconium Oxide	ZrO_2	123	RO_2		123	2700	—
Zirconium Silicate	$ZrSiO_4$	183.3	—		183.3	2550	—

Courtsey of Eureka Flint and Spar Co., Inc.

FUSING TEMPERATURES OF CERAMIC RAW MATERIALS

Material	Formula	Temperature Deg. C.
Aluminum Oxide (Alumina)	Al_2O_3	2050
Antimony Oxide	Sb_2O_3	1550
Arsenic Oxide	As_2O_5	200
Barium Oxide	BaO	$O_2$450
Bone Ash	$4Ca_3(PO_4)_2 \cdot CaCO_3$	——
Borax (Melted)	$Na_2B_4O_7$	732
Boric Acid	B_2O_3	577
Boric Oxide	B_2O_3	577
Calcium Fluoride (Fluorspar)	CaF_2	1300
Calcium Oxide (Lime)	CaO	2570
Calcium Phosphate	$Ca_3(PO_4)_2$	1550
Calcium Silicate (Wollastonite)	$CaSiO_3$	1540
Cerium Oxide	CeO_2	1950
Chromium Oxide	Cr_2O_3	196
Cobaltous Oxide	CoO	——
Copper Oxide (Cupric)	CuO	1235
Feldspar, Potassium	$K_2O \cdot Al_2O_3 \cdot 6SiO_2$	1170–1235
Feldspar, Sodium	$Na_2O \cdot Al_2O_3 \cdot 6SiO_2$	1120–1215
Fluorspar	CaF_2	1300
Iron Oxide (Ferric Oxide)	Fe_2O_3	1565
Kryolith	Na_3AlF_6	——
Lead Oxide	PbO	888
Lead Silicate	$PbO \cdot SiO_2$	766
Lithium Oxide	Li_2O	——
Magnesium Oxide	MgO	2800
Manganese Silicate	$MnSiO_3$	1273
Manganous Oxide	MnO	1650
Nickelous Oxide	NiO	$O_2$400
Phosphoric Oxide	P_2O_5	563
Potassium Oxide	K_2O	red heat
Potassium Silicate	$K_2O \cdot SiO_2$	976
Silica (Flint)	SiO_2	1710
Soda Ash (Sodium Carbonate)	Na_2CO_3	851
Sodium Antimonate	$2NaSbO_3 \cdot 7H_2O$	——
Sodium Oxide	Na_2O	red heat
Sodium Silicate	Na_2SiO_3	1080
Sodium Silico Fluoride	Na_2SiF_6	——
Tin Oxide (Stannic)	SnO_2	1127
Titanium Oxide	TiO_2	1560
Zinc Oxide	ZnO	1800
Zirconium Oxide	ZrO_2	2700

Courtsey of Eureka Flint and Spar Co., Inc.

Cold Tile and Brick Glaze

U. S. Patent 2,019,980

Portland Cement	10 parts by vol.
Iron Oxide	1 part by vol.
Calcium Stearate and Water (1–2%)	5 parts by vol.

Mix thoroughly and pass through a screen to remove lumps.

The glaze is now ready for application to the product or article, which, for example, may be cement tile, building blocks, or other suitable materials. This may be accomplished by brushing, dipping or spraying the glaze thereon until the desired coating is effected. The glazed objects may be trimmed and then placed in a curing chamber which is kept moist for several days. In order to get best results, the tiles are thereafter placed in storage for a week or longer, to age or cure, until the permanent hardening or setting of the glaze is completed.

Enamel Ware Undercoat

U. S. Patent 1,962,617

The base metal is sprayed with a suspension of

Cobalt Oxide	3 oz.
Bentonite	1.5 oz.
Water	100 oz.

CUBICAL COEFFICIENTS OF EXPANSION OF CERAMIC RAW MATERIALS

Material	Formula		X 10^{-7}
Aluminum Oxide (Alumina)	Al_2O_3	(0.52)	5.0
Antimony Oxide	Sb_2O_3		3.6
Arsenic Oxide	As_2O_5		2.0
Barium Oxide	BaO	(5.2)	3.0
Bone Ash	$4Ca_3(PO_4)_2 \cdot CaCO_3$		——
Borax (Melted)	$Na_2B_4O_7$		3.16
Boric Acid	B_2O_3	(—1.98)	0.1
Calcium Fluoride (Fluorspar)	CaF_2		2.5
Calcium Oxide (Lime)	CaO		5.0
Calcium Phosphate	$Ca_3(PO_4)_2$		3.65
Cerium Oxide	CeO_2		4.2
Chromium Oxide	Cr_2O_3		5.1
Cobaltous Oxide	CoO		4.4
Copper Oxide (Cupric)	CuO		2.2
Fluorspar	CaF_2		2.5
Iron Oxide (Ferric Oxide)	Fe_2O_3		4.0
Kryolith	Na_3AlF_6		7.4
Lead Oxide	PbO	(3.0)	4.2
Lithium Oxide	Li_2O		2.0
Magnesium Oxide	MgO	(1.35)	0.1
Manganous Oxide	MnO		2.2
Nickelous Oxide	NiO		4.0
Phosphoric Oxide	P_2O_5		2.0
Potassium Oxide	K_2O	(11.7)	8.5
Silica (Flint)	SiO_2	(0.15)	0.8
Sodium Antimonate	$2NaSbO_3 \cdot 7H_2O$		——
Sodium Oxide	Na_2O	(12.96)	10.0
Sodium Silicate	Na_2SiO_3		2.96
Sodium Silico Fluoride	Na_2SiF_6		5.0
Tin Oxide (Stannic)	SnO_2		2.0
Titanium Oxide	TiO_2		4.1
Zinc Oxide	ZnO		1.8
Zirconium Oxide	ZrO_2		2.1

Courtsey of Eureka Flint and Spar Co., Inc.

Pottery Glaze

French Patent 44,786

Feldspar	26 kg.
Quartz	2 kg.
Minium	49 kg.
Barium Borosilicate	15 kg.

This is applied with coloring materials after grinding, without fritting.

Flooring Tile

Norwegian Patent 55,221

The mass before drying is composed of linseed oil 7, coal tar 1, alkali silicate 1, varnish 1, water 1, glue 1, cement 1, quartz sand 5, clay 1 and salt 1 part, all by weight.

Colored Roofing Granules

U. S. Patent 1,944,294

Burned clay granules are impregnated with arsenic trioxide and surface washed. Then treat with 15% basic copper acetate solution, wash and dry.

Manufacture of Light-Weight Ceramic Tile

U. S. Patent 1,925,985

A mixture of ball clay 45–65 (56.7), plaster of Paris 10–20 (13.1), and sawdust (I) 25–40 (32.1) is rendered plastic by addition of 80–120 (103)% of water and cast into waxed molds. The dried tiles are heated for 4 hours at about 500° F. until (I) is charred, then slowly (4 hours) up to 1200°, at which temperature they are kept for 4 hours until the carbon is burnt out and shrinkage ceases.

White Enamel for Wire

U. S. Patent 1,938,691

Fuse together:

Borax	16.5 lb.
Feldspar	50–45 lb.
Silica	9.2 lb.
Soda Ash	20–25 lb.
Sodium Nitrate	3 lb.

Quench and grind with 8% titanium dioxide.

Light Weight Refractory

U. S. Patent 1,945,232

Brick or Pottery Clay	1 lb.
Rice Hull Ashes	2 lb.

When the above is fired the product is 40% lighter than usual.

Synthetic Lumber

U. S. Patent 1,974,277

Magnesium Oxide	30 lb.
Aluminum Oxide	20 lb.
Sawdust	50 lb.
Beach Sand	10 lb.

(*Continued on page* 245)

TEMPERATURE EQUIVALENT OR FUSING POINTS OF CONES

(Adopted from Table XIII, of U. S. Bureau of Standards' Report)

NOTE: These approximate values are given by the Bureau of Standards to the nearest 5° C. from the average determinations.

Soft Series:

Cone Number	When Fired Slowly 20° C. per Hour ° Cent.	° Fahr.	When Fired Rapidly 150° C. per Hour ° Cent.	° Fahr.
022	585	1085	605	1121
021	595	1103	615	1139
020	625	1157	650	1202
019	630	1166	660	1220
018	670	1238	720	1328
017	720	1328	770	1418
016	735	1355	795	1463
015	770	1418	805	1481
014	795	1463	830	1526
013	825	1517	860	1580
012	840	1544	875	1607
011	875	1607	905	1661
Low Temperature Series:				
010	890	1634	895	1643
09	930	1706	930	1706
08	945	1733	950	1742
07	975	1787	990	1814
06	1005	1841	1015	1859
05	1030	1886	1040	1904
04	1050	1922	1060	1940
03	1080	1976	1115	2039
02	1095	2003	1125	2057
01	1110	2030	1145	2093
Intermediate Temperature Series:				
1	1125	2057	1160	2120
2	1135	2075	1165	2129
3	1145	2093	1170	2138
4	1165	2129	1190	2174
5	1180	2156	1205	2201
6	1190	2174	1230	2246
7	1210	2210	1250	2282
8	1225	2237	1260	2300
9	1250	2282	1285	2345
10	1260	2300	1305	2381
11	1285	2345	1325	2417
12	1310	2390	1335	2435
13	1350	2462	1350	2462
14	1390	2534	1400	2552
15	1410	2570	1435	2615
16	1450	2642	1465	2669
17	1465	2669	1475	2687
18	1485	2705	1490	2714
19	1515	2759	1520	2768
20	1520	2768	1530	2786

TEMPERATURE EQUIVALENT OR FUSING POINTS OF CONES—*Continued*

High Temperature Series:

	When Heated at 100° per Hour ° Cent.	° Fahr.
23	1580	2876
26	1595	2903
27	1605	2921
28	1615	2939
29	1640	2984
30	1650	3002
31	1680	3056
32	1700	3092
33	1745	3173
34	1760	3200
35	1785	3245
36	1810	3290
37	1820	3308
38	1835	3335
*39	1865	3389
40	1885	3425
41	1970	3578
42	2015	3659

* The last four cones were heated at 600° per hour.

Courtsey of Eureka Flint and Spar Co., Inc.

Moisten with magnesium chloride solution and calcium magnesium chloride and after forming dip in a solution of magnesium silicofluoride and potassium sulphate.

Building Material

Austrian Patent 137,323

A fibrous organic material 3, a pulverulent mineral 5–7.5 and water-glass solution of 36–38° Bé. 5–7.5 parts are mixed together, molded in a perforated mold, and dried. The organic material may be wood pulp, straw or sugar-cane waste and the mineral may be asbestos or kaolin.

Composition for Floors and Wall Surfaces

Austrian Patent 137,328

Dried sawdust 40–60, cement 30–40 and lime 5–10 parts are kneaded with 50–70 parts of concentrated water-glass solution. The dried composition can be subjected to the same mechanical treatments as wood.

Artificial Gypsite Plaster

U. S. Patent 1,932,120

Gypsum	26,180 lb.
Dry Peat	600 lb.
Clay	2,820 lb.

Stir and heat with calcium chloride solution (d. 1.4) 4 qt. in a plaster kettle heating at 155–165° C.

Opal Vitreous Marble, Artificial

French Patent 784,067

Sand	500 kg.
Soda Ash	200 kg.
Lime	100 kg.
Sodium Nitrate	20 kg.
Spar	60 kg.
Feldspar	70 kg.
Antimony	1.6 kg.
Arsenic	0.2 kg.
Manganese	0.6 kg.
Zinc Oxide	20 kg.
Fish Offal or Blood	200 kg.

Artificial Marble

Formula No. 1

British Patent 416,774

White Cement	50 lb.
Marble Dust	50 lb.
Calcium Carbonate Powder	3.85 lb.
Calcium Oxalate	0.50 lb.
Borax	0.15 lb.
Starch	0.60 lb.

Mix with water and allow to set.

No. 2

British Patent 430,948

Magnesium Oxide	100 lb.
Marble Dust	30 lb.
Calcium Sulphate Dust	20 lb.

Make into a paste with magnesium chloride (d. 1.20–1.26) and then add

Magnesium Oleate	1 lb.
Magnesium Stearate	1 lb.
Tallow Soap Solution (2%)	10 lb.

STANDARD SCALES FOR TESTING SIEVES

U. S. Standard Sieve Series						Tyler Standard Sieve Series					
Meshes per Lineal Inch	Sieve Number	Sieve Opening (Inches)	Sieve Opening (Millimeters)	Wire Diameter (Inches)	Wire Diameter (Millimeters)	Tyler Standard $\sqrt{2}$ or 1.414 (Openings in Inches)	For Closer Sizing Sieves from .0029 to 1.050-in. Ratio $\sqrt[4]{2}$ or 1.189	Openings (Millimeters)	Openings (Fractions of Inch) (Approx.)	Mesh (Per Lineal Inch)	Diameter of Wire (Inches)
2.58	2½	.315	8.00	.073	1.85	1.0	1.050	26.67	1	—	.148
3.03	3	.265	6.73	.065	1.65	—	.883	22.43	⅞	—	.135
3.57	3½	.223	5.66	.057	1.45	.742	.742	18.85	¾	—	.135
4.22	4	.187	4.76	.050	1.27	—	.624	15.85	⅝	—	.120
4.98	5	.157	4.00	.044	1.12	.525	.525	13.33	½	—	.105
5.81	6	.132	3.36	.040	1.02	—	.441	11.20	7/16	—	.105
6.80	7	.111	2.83	.036	.92	.371	.371	9.423	⅜	—	.092
7.89	8	.0937	2.38	.0331	.84	—	.312	7.925	5/16	2½	.088
9.21	10	.0787	2.00	.0299	.76	.263	.263	6.680	¼	3	.070
10.72	12	.0661	1.68	.0272	.69	—	.221	5.613	7/32	3½	.065
12.58	14	.0555	1.41	.0240	.61	.185	.185	4.699	3/16	4	.065
14.66	16	.0469	1.19	.0213	.54	—	.156	3.962	5/32	5	.044
17.15	18	.0394	1.00	.0189	.48	.131	.131	3.327	⅛	6	.036
20.16	20	.0331	.84	.0165	.42	—	.110	2.794	7/64	—	.0328
23.47	25	.0280	.71	.0146	.37	.093	.093	2.362	3/32	8	.032
27.62	30	.0232	.59	.0130	.33	—	.078	1.981	5/64	9	.033
32.15	35	.0197	.50	.0114	.29	.065	.065	1.651	1/16	10	.035
38.02	40	.0165	.42	.0098	.25	—	.055	1.397	—	12	.028
44.44	45	.0138	.35	.0087	.22	.046	.046	1.168	3/64	14	.025
52.36	50	.0117	.297	.0074	.188	—	.0390	.991	—	16	.0235
61.93	60	.0098	.250	.0064	.162	.0328	.0328	.833	1/32	20	.0172
72.46	70	.0083	.210	.0055	.140	—	.0276	.701	—	24	.0141
85.47	80	.0070	.177	.0047	.119	.0232	.0232	.589	—	28	.0125
101.01	100	.0059	.149	.0040	.102	—	.0195	.495	—	32	.0118
120.48	120	.0049	.125	.0034	.086	.0164	.0164	.417	1/64	35	.0122
142.86	140	.0041	.105	.0029	.074	—	.0138	.351	—	42	.0100
166.67	170	.0035	.088	.0025	.063	.0116	.0116	.295	—	48	.0092
200	200	.0029	.074	.0021	.053	.0082	.0082	.208	—	65	.0072

—	.0097	.246	—	60	.0070
238.10	230	.0024	.062	.0018	.046
270.26	270	.0021	.053	.0016	.041
323	325	.0017	.044	.0014	.036

This sieve scale is essentially metric. The sieve having an opening of 1 mm. is the basic one, and the sieves above and below this in the series are related to it by using the fourth root of 2, or 1.1892 as the ratio of the width of one opening to the next smaller opening. In making selections from this series it is recommended that this be done on some systematic plan, as for example, the selection of every other sieve or of every fourth one in the series.

—	.0069	.175	—	80	.0056
.0058	.0058	.147	—	100	.0042
—	.0049	.124	—	115	.0038
.0041	.0041	.104	—	150	.0026
—	.0035	.088	—	170	.0024
.0029	.0029	.074	—	200	.0021
For coarser sizing—3- to 1½-inch opening					
—	—	—	3	—	.807
—	—	—	2	—	.192
—	—	—	1½	—	.148

This sieve scale has as its base an opening of .0029 inch which is the opening in 200-mesh .0021-inch wire, the standard sieve, as adopted by the U. S. Bureau of Standards, the openings increasing in the ratio of the square root of 2 or 1.414.

Where a closer sizing is required column 2 shows the Tyler Standard Screen Scale with intermediate sieves. In this series the sieve openings increase in the ratio of the fourth root of 2 or 1.189.

Courtesy of Eureka Flint and Spar Co., Inc.

Stone Wood Composition Flooring
British Patent 426,739

A 1:9 mixture of sodium thiosulphite and calcium carbonate is added to plaster of paris containing sawdust or cork filler. Proportions by volume of 1:5:4 respectively are preferred.

Artificial Stone Flooring
U. S. Patent 1,968,784

Calcined Magnesite	100 lb.
Sawdust	200 lb.
Fine Stone Screenings	50 lb.
Magnesium Chloride	100 lb.
Emulsified Asphalt	1½ gal.
Water	to make a soft mortar

"Eternit" Artificial Slate

Cement	100 lb.
Asbestos	20–25 lb.
Pigment	5 lb.
Rosin Solution	to suit

Artificial Stone
British Patent 430,404

(*a*) Portland cement 2 and clay dust 0.25 are mixed, (*b*) cement 2 and slate dust 1 are mixed therewith, (*c*) cement 2 and shale 1 are mixed therewith, (*d*) cement 2 and river of sea sand 1 parts are mixed therewith, (*e*) the calcium oxide solution is added, 0.5 gal. at a time, with mixing after each addition. (7 lb. of calcium oxide and 2 gal. of water may be used for each 28 lb. of cement), (*f*) the product is molded into slabs, dried 24 hours and then baked 2 hours at 100° C. The slabs are then painted, heated 1 hour, cooled 30 minutes, coated with enamel or cellulose paint, heated 2 hours at 150°, smoothed with cuttlefish bone and polished.

Wall Board, Artificial
U. S. Patent 1,976,190

Calcined magnesite 12 parts; sawdust 3 parts; an aqueous solution of magnesium chloride at about 18° Bé., 14 parts; molasses ¼ of 1 part; said ingredients being combined in a creamy fluid mixture sufficiently thin to be readily poured into a form or mold.

Commercial Porcelain

The clay used in making porcelain varies in each locality and it will thus be necessary in the following formulas to include the chemical analysis of the clay

and spar used. The physical properties of various mixtures are best illustrated by the triangular diagram shown by Gilchrest and Klinefelder in the Electric Journal, March and April, 1918. This diagram shows the variation of mechanical, electrical and thermal properties with variation in mixture.

The usual mixtures for electrical porcelain is 40–50% clay, 25–30% spar and 25% quartz. The European insulator materials are ground extremely fine and fired to a hard glass-like body, usually Seger cone 14–16.

German Porcelain Mixtures

Insulator Porcelain

Kaolin from Halle	50.4%
Clay from Halle	31.5%
Spar	18.1%

Equal to 53% clay substance, 29% quartz and 18% spar.

Household Porcelain

Formula	No. 1	No. 2	No. 3
Kaolin from Halle	55%	60 %	22.4%
Clay from Halle	27%	—	44.8%
Zettlitzer Kaolin	—	18 %	16.2%
This equals			
Clay Substance	54%	55 %	60 %
Quartz	28%	22.5%	22.5%
Spar	18%	22.5%	17.5%

The kaolin from "Halle" mines contains about 61.77% clay substance, 37.84% quartz and .39% spar. The clay from the same mines are about 70% clay substance and 30% quartz.

Karlsbaden Czechoslovakian Porcelain

Clay Substance	52 %
Quartz	29.62%–24.5 %
Spar	17.26%–21.93%
Calcium Carbonate	1.25%– 1.6 %

Danish Porcelain

Clay Substance	31.8%
Quartz	30.8%
Spar	33 %

Chinese Porcelain

Clay Substance	31.8%
Quartz	30.8%
Natrium Spar	19.4%
Mica	18 %

The firing temperature of the German and Danish porcelain varies between Seger Cone No. 14 and No. 16. The household china is usually bisquit fired at a temperature of about 900° C. before glazing and then glazed and given the final firing at about 1400° C. They are then painted or decorated and given short firing at about 600° to set the colors.

The quartz used chiefly in the above mixtures comes from Sweden, the feldspar from Norway, whereas some of the best clays come from Czechoslovakia, although good raw materials are obtainable in many countries.

The chemical analysis of the above materials is as follows:

Zettlitzer Clay	12.65%
Silicic Acid	46.9 %
Aluminum Oxide	38.56%
Ferric Oxide	.84%
Potash and Sodium Oxide	1.05%

Giving the following technical analysis

Clay Substance	98.8 %
Quartz and Spar	1.2 %

Feldspar	Norwegian	Czechoslovakian
Silicic Acid	62.25%	54.5 %
Aluminum Oxide	19.96%	19.75%
Ferric Oxide	.35%	1.75%
Potash (K_2O)	14.32%	11.5 %
Lime (CaO)	.55%	——
Magnesia (MgO)	.21%	——
Sodium Oxide (Na_2O)	1.36%	——

Magnesia Porcelain

This porcelain usually consists of about 85% powdered talcum and 15% settled gelantinic magnesium silicate, or 80% talcum and 20% China clay. These magnesia porcelains have very good electrical and mechanical properties and extremely small shrinkage during firing allowing the pieces to be made to very close dimensions. They also retain their high electrical resistance up to very high temperatures.

The chemical formulas for some of the glazes used by various European manufacturers are as follows:

German Glaze

$$\left.\begin{array}{l}.11 \text{ Potash}\\ .67 \text{ Lime}\\ .22 \text{ Magnesium Oxide}\end{array}\right\} \text{Aluminum Oxide} + 10 \text{ Silica}$$

The above glaze is made from

.11 Potash + .11 Aluminum Oxide + .66 Silica	= 61.27 lb. Spar
.67 Lime	= 67 lb. Marble
.22 Magnesium Oxide as Magnesite	= 18.48 lb. Magnesite
.89 Aluminum Oxide + 1.78 Silica	= 230.5 lb. Zettlitzer Clay
7.56 Silica	= 453.6 lb. Hohenbacker Sand

Another clear and fine German glaze consists of

.3 Potash } .8 Aluminum Oxide + 8 Silica
.7 Lime }

Danish Glaze

.65 Potash } Aluminum Oxide + 15 Silica
.35 Lime }

This glaze is made of

China Clay	6.75 lb.
Quartz	48.75 lb.
Spar	28 lb.
Crayon	2.75 lb.
Bisquit fired porcelain (Powdered)	13.75 lb.

All the above formulas are based on pure European porcelain materials and if materials obtained locally are used a thorough chemical and rational analysis must be made of the raw materials used and the formulas corrected for the varying compositions of the materials.

Low Expansion Borosilicate Glass
U. S. Patent 2,012,552

A borosilicate glass having a thermal coefficient of expansion of about .000005 and consisting essentially of silica 72%, magnesia 12%, boric oxide 8%, sodium oxide 6% and potassium oxide 2%.

Ultra Violet Stable Glass
British Patent 424,366

Potassium Carbonate	13.77 lb.
Potassium Nitrate	6.71 lb.
Calcium Carbonate	8.93 lb.
Barium Carbonate	3.22 lb.
Magnesium Carbonate	18.53 lb.
Boron Oxide	31.04 lb.
Aluminum Oxide	28.80 lb.
Diammonium Hydrogen Phosphate	48.70 lb.

Brown Glass
U. S. Patent 2,014,230

A batch for making brown glass comprises in addition to the ordinary glass composition 0.5 to 3.0% of ammonium sulphate and 0.5 to 5.0% of organic matter.

Coloring Glass
Austrian Patent 140,547

Colored coatings are produced on sulphide glass not containing free carbon. A typical sulphide glass is made from

Sand	87 lb.
Soda Ash	20 lb.
Potassium Carbonate	10 lb.
Lime	11 lb.
Borax	2 lb.
Ferrous Sulphide	3 lb.

Colored Coating Composition

Cuprous Oxide	30 lb.
Calcined Copper Sulphate	30 lb.
Calcined Clay	120 lb.

Luminescent Glass
British Patent 415,536

Zinc sulphide and/or cadmium sulphide, etc. are/is either added to the glass or formed in the glass by reduction of the corresponding sulphates with zinc, tin, magnesium powders, carbon, sulphur, etc. or by combination of the oxides or carbonates with sulphur. The presence of 0.01–0.4% of a heavy metal (cadmium, copper, antimony, manganese, etc.) is also necessary. An orange-yellow glass is composed of silicon dioxide 66, aluminum oxide 3, boric anhydride 3, calcium oxide 3, zinc oxide 5, potassium oxide 5.5, sodium oxide 11.5, manganese sulphide 0.63, and zinc sulphide 2.37%.

Cream Colored Opaque Glass
U. S. Patent 1,956,176

Fuse together

Sand	885 lb.
Soda Ash	306 lb.
Feldspar	675 lb.
Cryolite	90 lb.
Calcium Fluoride	50 lb.
Sodium Nitrate	30 lb.
Arsenic Trioxide	4–10 lb.
Ferric Oxide	4–10 lb.
Sodium Uranate	2– 7 lb.
Selenium	⅛–⅝ lb.

Vacuum Tube Glass
U. S. Patent 1,969,277

Boric Oxide	40 to 60 lb.
Sodium Oxide	4 to 5 lb.
Calcium Oxide	10 to 11 lb.
Alumina	11 to 13 lb.
Silica	20 to 30 lb.

Lightly "Frosted" Glass

Gelatin	4.5 g.
Sodium Fluoride	2 g.
Water	30 cc.

The gelatin is first dissolved in the water and then the sodium fluoride is added. The solution is then poured over a glass plate and the latter is allowed to dry in a horizontal position. When com-

pletely dry, the plate is immersed in a dilute solution of hydrochloric acid for 30 seconds, and is then again allowed to dry. The remainder of the gelatin may then be removed with the aid of hot water.

Acid- and Waterproof Cement
U. S. Patent 1,973,731

Silicate cements are rendered harder and denser by the addition of ½ to 2% of aluminum or calcium hydroxide and sodium silico-fluoride.

Special Cement
French Patent 777,055

Portland Cement Clinker	20–25 kg.
Slag	50–55 kg.
Silica	8–12 kg.
Slaked Lime	8–12 kg.
Plaster Stone	2– 6 kg.

Grind all together.

Cellular or Light Weight Concrete
U. S. Patent 1,985,905

A slurry is formed by mixing cement with following foam producing compound:

Water	500 lb.
Casein	100 lb.
Slaked Lime	25 lb.
Benzaldehyde	7 lb.
Beta Naphthol	1 lb.
Arsenic Trioxide	1 lb.

Coloring Concrete

For coloring white Portland cement, 5 to 10% of the following materials are generally employed:

Iron Oxides	Red, yellow, brown, black
Manganese Dioxide	Brown, black
Chromium Oxide	Green
Ultramarine Blue	Blue
Cobalt Blue	Blue
Carbon Pigments	Black

Certain types of pigments such as those containing Prussian blue, zinc and lead chromates, and cadmium lithopone cannot be used. Chrome green needs to be carefully distinguished from chromic oxide green. Lead oxide pigments are unsuitable and ultramarine is not entirely stable. The fading of colored concretes is due to the formation of a film of calcium carbonate on the surface.

Fire Resistant Concrete
Hungarian Patent 109,616

Chamotte Flour (10 mil.gr.)	3 qt.
Cement	1 qt.
Quartz Powder	1 qt.

Waterproofing Mortar and Concrete
Austrian Patent 138,387

Olein	10 kg.
Ammonia (0.910)	2 l.

Mix until uniform and then add slowly with stirring

Aluminum Sulphate (22° Bé.)	2 l.
or Zinc Oxide	2 kg.

In use, the above mixture is added to 100 times its weight of 20% milk of lime and the latter is used in place of the water to be used with the cement.

Flexible Paving Material
U. S. Patent 1,961,678

Approximately 60% of coarse (¼-1½-in.) anthracite bone and rock from a cleaning plant together with fillers, e.g., sand 30 and marble dust 5%, is mixed with 6–12% of a bituminous binder.

Road-Surfacing Material
Swedish Patent 80,677

Slabs for road, sidewalk and floor surfacing are made from a mass consisting of 20.4% wood tar, 20.4% coarse sand below 3 mm. size, 40.8% fine sand having a grain size of 0.25–2.0 mm., 4.1% ground unslaked lime, 8.2% cement and 6.1% of fireclay.

Tennis Court and Path Surfacing
British Patent 430,001

Twelve pounds rosin are mixed hot with 1 gal. raw linseed oil and 1 oz. powdered alum, 2 gal. of the resulting syrup being mixed with 6 cu. ft. dry sand and 30 oz. chrome green being added. If a quick-setting, tough material is required, 70 oz. of tung oil and 5% (calculated on total oils) of a 4% cobalt linoleate are added.

Asphalt Powder
German Patent 613,620

Asphalt (M.P. 45° C.)	3 lb.
Glass or Mica Powder	1 lb.

Warm and mix, cool and powder.

Pavement Joint Packing
U. S. Patent 2,016,404

Rubber	40 lb.
Asphaltum	7 lb.
Whiting	46 lb.
Sulphur	3 lb.
Ammonium Carbonate	2 lb.

Work into a porous mass and cure by heating.

Refractory Compound
British Patent 413,398

A mixture of refractory plastic clay with finely ground glass (of any quality) borax and sodium chloride (e.g., 20, 2, 1 and 3 parts by weight respectively) yields refractory products of increased durability and is also suitable for use as a refractory plaster or cement.

Ingot Mold Refractory
U. S. Patent 1,984,759

Chrome Ore	8–10 lb.
Basic Slag	2–.5 lb.
Magnesite	10–12 lb.
Calcined Fire Clay	50–30 lb.
Plastic Clay	10–15 lb.
Common Fire Clay	20–28 lb.

Spark Plug Refractory
British Patent 422,474

Corundum	96 lb.
Titanium Dioxide	2 lb.
Magnesium Dioxide	2 lb.

Heat; grind; mix with a little acid, mold and fire at 1630° C.

Refractories Resistant to Spalling

Bricks for suspended arches of boiler furnaces can be made of a highly aluminous clay containing silica 54.48, aluminum oxide 43.18, ferric oxide 1.10, calcium oxide 0.86, magnesium oxide 0.18%; ignition loss was 0.32%. No plastic clay was added.

Fused Silica, Improved
U. S. Patent 1,984,178

An insulating composition having essentially the properties of fused silica but being characterized by improved workability when plastic and decreased brittleness, consists mainly of silica and contains as constituents about 1/7 to 1½ per cent of beryllium oxide anl about ⅕ to 2% of aluminum oxide.

Inorganic Electric Insulation for Steel
U. S. Patent 1,951,039

Steel sheets are coated with a mixture of

Lime	15 lb.
Iron Oxide	28 lb.
Sodium Silicate	70 lb.
Water	200 lb.

Bake at 240° C. and anneal at 800° C.

Tooth Stump Model for Dental Crowns
British Patent 421,872

Aluminum Oxide	50 oz.
Silica	16 oz.
Calcium Sulphate	33 oz.
Gold Chloride Solution (1%)	1 oz.

Insulating Decorative Molding
British Patent 430,041

Hydrofluorosilic Acid	15 lb.
Sodium Silicate	8 lb.
Mica Powder	20 lb.
Asbestos	65 lb.
Algolite	15 lb.
Water	to make plastic

Sound Absorbing Composition
U. S. Patent 1,996,032

Mineral Wool	85½ lb.
Glue	2 lb.
Cooked Starch	9 lb.
Pyrophyllite	2½ lb.
Beta Naphthol	½ oz.
Aluminum Sulphate	2 oz.

Treating Peeled Rattan
U. S. Patent 1,959,463

The plugs are impregnated with a 1% aqueous solution of glycerol, water is evaporated and the treated plug is sprayed with a solution formed of celluloid 2 lb. and acetone 1 gal. to which powdered aluminum 20 g. and powdered zinc 3 g. have been added, to serve as a sealing and preservative agent.

Minimizing Wood Shrinking and Swelling

Soak wood in water in a vacuum chamber, the air being removed by alternate evacuation and breaking the vacuum. Soak for a week in "Cellosolve" and then distil under vacuum of 60 cm. mercury at 40–45° C. in a number of steps over a period of 3 days. Dry, distil at 100° C. The "Cellosolve" may be sub-

sequently replaced, if desired, by soaking in oil or molten wax for more than a week at temperatures up to 85–90° C.

Wood Antiseptic and Fireproofing
British Patent 425,495

Combined fireproofing and preservative properties are claimed for mixtures in aqueous solution of a metallic phosphate, a borate, and a chloride. Impregnation of wood can be undertaken in the usual metal apparatus, since the ingredients are without chemical action on iron. Being resistant to temperatures up to 1000° C., the materials specified not only prevent spread of combustion, but smother flames entirely. These preparations are also said to be suitable for preserving and fireproofing paper, fabrics, etc., by the simple process of soaking. An example of a water-insoluble preparation comprises 5 lb. dibasic sodium phosphate, 3 lb. sodium tetraborate, 1 lb. zinc chloride, 12 lb. 25% aqueous ammonia solution, and 90 pt (maximum) water.

Fireproofing for Wood

Ammonium Phosphate	100 kg.
Boric Acid	10 kg.
Water	1000 l.

Mix and dissolve and immerse wood in it.

Hardness Scale

1. Talc
2. Rocksalt
3. Calcite
4. Fluorite
5. Apatite
6. Feldspar
7. Quartz
8. Topaz
9. Corundum
10. Diamond

Hardness of Materials

The above numbers give only the order of arrangement as to hardness.

Agate	7.	Hematite	6.
Alabaster	1.7	Hornblende	5.5
Alum	2–2.5	Iridium	6.
Aluminum	2.	Iridosmium	7.
Amber	2–2.5	Iron	4–5.
Andalusite	7.5	Kaolin	1.
Anthracite	2.2	Lead	1.5
Antimony	3.3	Loess (0°)	0.3
Apatite	5.	Magnetite	6.
Aragonite	3.5	Marble	3–4.
Arsenic	3.5	Meerschaum	2–3.
Asbestos	5.	Mica	2.8
Asphalt	1–2.	Opal	4–6.
Augite	6.	Orthoclase	6.
Barite	3.3	Palladium	4.8
Beryl	7.8	Prosphor Bronze	4.
Bell-metal	4.	Platinum	4.3
Bismuth	2.5	Plat-Iridium	6.5
Boric Acid	3.	Pyrite	6.3
Brass	3–4.	Quartz	7.
Calanime	5.	Rock-Salt	2.
Calcite	3.	Ross' Metal	2.5–3.0
Copper	2.5–3.	Silver Chloride	1.3
Corundum	9.	Sulphur	1.5–2.5
Diamond	10.	Stibnite	2.
Dolomite	3.5–4.	Serpentine	3–4.
Feldspar	6.	Silver	2.5–3.
Flint	7.	Steel	5–8.5
Fluorite	4.	Talc	1.
Galena	2.5	Tin	1.5
Garnet	7.	Topaz	8.
Glass	4.5–6.5	Tourmaline	7.3
Gold	2.5–3.	Wax (0°)	0.2
Graphite	0.5–1.	Wood's Metal	3.
Gypsum	1.6–2.	Zinc	2.5

Wood Preservative
British Patent 424,941

On impregnating wood with a mixture of a chromate, a salt of a heavy metal—i.e., a metal with a specific gravity greater than 4—and sodium fluoride, a reaction is claimed to take place in contact with the acids and the cellulose in the wood with formation of water-insoluble substances exercising powerful fungicidal action. A preferred mixture comprises 50% potassium or sodium bichromate, 30% zinc chloride, and 20% sodium fluoride, and the impregnation can be effected by standard methods such as a vacuum and pressure process, using a 1% aqueous solution.

Wood Preservative
British Patent 425,781

Impregnate with a solution of

Potassium Dichromate	5.6 lb.
Copper Sulphate	5 lb.
Chromium Basic Acetate	0.53 lb.
Acetic Acid	0.80 lb.
Water	89 lb.

Boric acid and ammonium dihydrogen phosphate may be added for fireproofing.

Creosote Wood Preservative Emulsion

Glue	0.08 g.
Sulphonated Fatty Alcohol	0.02 g.
Creosote	50 g.
Water	50 g.

Allow first two items to swell in water and then mix with creosote and run through colloid mill. Stability is improved by neutralizing any free acidity in creosote with alkali.

Cresylic Wood Impregnation Bath

Cresylic Acid	100 lb.
Red Oil (Double Pressed)	100 lb.
Caustic Soda Solution 32° Bé.	20 lb.

Manipulation: Add caustic soda solution to red oil at 50° C., add cresylic acid slowly with constant agitation and cool rapidly.

Arsenic Cement Coating for Wood Piling

Sand	12 lb.
Cement	3 lb.
Arsenic, White	1 oz.

Mix dry and add water before use. Then apply to piling by air gun.

Oil for Wood Preservation

Carbolineum, Pale (Bleached with Chlorine, Tar Oil)		80 g.
Rosin, Pale		20 g.
Anilin Dye, Oil-Soluble		to suit
Linseed Oil	optionally	5–10 g.
Drier	optionally	1– 3 g.

PAPER

Paper Coating
Formula No. 1

Argentine or Silver Paper:

Argentine Pulp 40%	90	lb.
Casein Solution (¼ lb. per gal.)	2½	gal.
Carnauba Wax Emulsion	½	gal.
Toluol	1	pt.
Carbon Tetrachloride	1	pt.
Nigrosin	9	oz.

The casein solution is made as follows:

Casein	62	lb.
Borax	7	lb.
Trisodium Phosphate	7	lb.
Water to make	50	gal.

The carnauba wax emulsion is made with this formula:

Carnauba Wax	140	lb.
Castile Soap	20	lb.
Water to make	140	gal.

No. 2

A coating mixture which will give a high finish when calendered is made up as follows:

Water	65	gal.
Soda Ash	3	lb.
Ammonia	4	gills
Satin White Pulp	440	lb.
English Clay	650	lb.

Stir untill thoroughly mixed and smooth and add the following casein solution:

Water	50	gal.
Casein	100	lb.
Soda Ash	10	lb.
Trisodium Phosphate	7	lb.
Borax	5	lb.
Ammonia	6	gills

This coating mixture will produce a high finish when calendered, that is suitable for the highest grade lithographic or process printing.

No. 3

Wax Emulsion for Flint Paper

Yellow Laundry Soap	7	lb.
Carnauba Wax	50	lb.
Water	12½	gal.

Boil with live steam till thoroughly emulsified (from 3–4 hours).

Cool to 35° C. and add

Ammonia (28°)	2	lb.
Cold Water to make	50	gal.

The emulsion should be allowed to stand for at least 24 hours before use as it seems to improve with age. This emulsion is added to the coating mixture in sufficient amount to give the desired gloss when the paper is flinted.

No. 4
Canadian Patent 344,222

Phthalic acid (8.5) and caustic soda (5.5 parts) are dissolved in 1300 parts of water at room temperature. White molding plaster or calcined gypsum (850 parts) is added and the mix is stirred for 1 hour. To this slurry is added 1100 parts of casein glue containing 170 parts of dry casein. The product is used directly on the paper-coating machine. The method may be modified for the utilization of a mixture of the deflocculated gypsum and coating clay by using soda ash as the electrolyte, and Turkey-red oil may be added to the final product.

Playing Cards
British Patent 405,502

The cards are composed of a core of textile fabric impregnated with a solution of cellulose derivative and coated on both sides with a layer or layers of cellulose derivative solution containing such a small amount of plasticizing agents that the cards are elastic. A suitable composition consists of cellulose acetate 2.5, acetone 4, denatured alcohol 6, castor oil (plasticizer) 0.35 and dry pigment 0.16 kg. To make the card opaque the composition used for coating one side may contain metallic pigments, e.g., bronze powder.

Stencil Sheets
U. S. Patent 2,004,484

Yoshino paper is coated with

Gelatin	13	oz.
Hard White Soap	42	oz.
Almond Oil	56	oz.

Treating Parchment Paper for Wrapping Butter

Parchment for salt butter is immersed for ten minutes in a solution of 2½ lb. salt in 10 gal. water heated to 220° F.

Separating (Non-Sticking) Paper
U. S. Patent 2,017,449

A flexible fibrous sheet is coated with

Sodium Silicate	140 g.
Glycerin	15 g.
Carnauba Wax Emulsion	1 g.

Gummed Paper
U. S. Patent 1,940,363

A thin film of adhesive composed of 90% of dextrin and 10% of gelatin glue applied to transparent paper enables it to be printed with common quick-drying inks and to adhere to glass.

Waterproofing for Paper

Trihydroxyethylamine Stearate	4½ lb.
Stearic Acid	½ lb.
Water	100 lb.

Boil and mix until smooth; pour into this slowly while stirring vigorously

Paraffin Wax (Heated to 90–100° C.)	30 lb.

Stir until cool.

Use 1 part of above emulsion to 5–10 parts of warm water.

Non-Staining Waterproofing for Paper
U. S. Patent 1,968,907

Petrolatum Wax	25–90 lb.
Ester Gum	5–75 lb.
Paraffin Wax	5–50 lb.

Waterproofing for Paper
Australian Patent 5604

Shellac	22 oz.
Alcohol	75 oz.
Formaldehyde	3 oz.

Waterproofing Paper and Fiber Board
Canadian Patent 343,302

The strength and water resistance of fibrous material are increased by beating in a liquor containing ¾ to 4 lb. of casein per 100 lb. of pulp lime from 10 to 25% of the weight of the casein, and sodium fluoride from 5 to 12.5% of the weight of the casein. The material treated may be paper, fiber board, asbestos board or the like. The strength and water resistance may be increased if a relatively small quantity of formaldehyde is added to the treating solution. If the fiber so treated is somewhat too brittle, a softening agent such as glycerol, sulphonated or saponified oil or fat may be added to the treating composition.

Waterproofing Paper and Textiles
U. S. Patent 1,981,405

Glue	15 oz.
Water	83 oz.
Formaldehyde	1–2 oz.

Dissolve glue in water and mix formaldehyde with it vigorously and spray immediately on material to be waterproofed.

Embossed Waterproof Wallpaper
U. S. Patent 1,936,355

Stearic Acid	4 lb.
Japan Wax	5 lb.
Triphenyl Phosphate	8 lb.
Dibutyl Phthalate	1 lb.

Heat to 90° C. and add

Water Shellac (40%)	56 lb.
Triethanolamine	2 lb.

Cool to 70° C. and add successively with vigorous stirring

Ammonia (28%)	1 qt.
Water	3 gal.
Ammonia (28%)	3 qt.
Water	3 gal.
Latex + 4% Sulphur	3 lb.
Water	to make 28 gal.

Odorless Greaseproof Paper and Textiles
British Patent 431,191

This composition comprises a cellulose derivative and rubber or chlorinated rubber dissolved in a solvent free from benzene or its derivatives and containing di-, tri-, or per-chloroethylene and/or methylene chloride. The composition may be employed for the production of artificial silk, filaments, threads, films, sheets, and the like, in which case the preferred proportions are chlorinated rubber 30 to 50 parts and cellulose derivative (nitrate or acetate) 800 to 900 parts. A typical solvent for such a mixture comprises trichloroethylene or methylene chloride 180 to 300 parts, and acetone 2000 to 3375 parts. A further application of the composition is in the production of an odorless and grease-proof wrapping paper, and of coated textile and like sheets. A

suitable composition for this purpose comprises chlorinated rubber 15 to 20 parts, cellulose nitrate or acetate 60 to 80 parts, dissolved in a mixture of trichloroethylene 90 to 120 parts and acetone or methylene chloride 1000 to 1300 parts. To this composition may be added a mixture of diethyl phthalate, castor oil and paraffin oil as plasticizer. A paper base may be coated by passing it through the composition, which is maintained at a temperature of 28–38° C. and the coating dried by passing through a drying chamber. The drying step is preferably followed by a humidifying operation by passing the coated paper through a tower containing humidified air. In place of the cellulose acetate or nitrate there may be used benzyl cellulose. The rubber and the cellulose derivatives may be dissolved together, or may be dissolved separately and the solutions mixed.

Wax Size, Paper

Formula No. 1

U. S. Patent 2,009,488

First emulsify a corn oil soap with water to form a paste. Next mix into this paste modified starch in the ratio of preferably approximately about 15 parts of modified starch to 10 parts of corn oil soap. Thereafter, and while the mixture of corn oil soap and modified starch is constantly agitated, incorporate a wax, preferably melted paraffin, although other waxes such as montan, japan, carnauba, etc., may be used alone or in substitution for a portion of the paraffin. The wax may be incorporated in the amount of 75 parts to 15 parts of modified starch and 10 parts of soap.

The mixture thus produced may be incorporated in the beaters in which event add a small percentage of paper manufacturers' alum to aid in the precipitation as the retention of the size is increased in this way. The mixture thus produced may also be used as a surface sizing and so used as mixed with sufficient water to produce the desired fluidity. The amount of water equal to the weight of the wax component is satisfactory.

The corn oil soap prevents foaming in the compounding of the size and the modified starch eliminates to a large degree the softening effect upon the paper heretofore produced through the use of wax emulsion sizes.

The resulting size paper has a high finished hard surface and the sizing is equally applicable to cellulosic and asbestos paper stocks. In connection with asbestos paper, the resulting size renders the paper highly water resistant.

No. 2

Canadian Patent 352,422

Pulp Fiber (Dry Weight)	1,000 lb.
Water	20,000 lb.
Mix in a beater and add	
Calcium Carbonate	300 lb.
Ammonium Resinate (Dry Weight)	15 lb.
Water	500 lb.
Alum	15 lb.

Plant Cover and Fruit Wrapping Paper

Canadian Patent 346,222

To each ton of unbleached sulphite pulp is added 160 lb. of thick size, or other suitable size equivalent to 112 lb. of dry size. The stock is beaten for 30 minutes; then 40 lb. of copper sulphate in suitable water solution is added to the stock. Beating is continued for 15–20 minutes. A slight excess of size is maintained with a backwater pH of not less than 6.0. The paper prepared from the stock will contain an excess of the desired 1% per weight of copper resinate; that amount of copper resinate being considered necessary to impart to the paper sufficient resistance to the deterioration and destruction of its fiber when used as a plant cover or fruit wrapper.

Detecting Artificial Watermarks in Paper

Artificial watermarks produced by impression on the nearly dried paper with a rubber stamp are differentiated from the genuine by sprinkling the area with a mixture of 100 g. of dry icing sugar and 0.5 g. of concentrated Rhodamine-6G, placing the paper in a dish of water, and examining in filtered ultra-violet light. The design of genuine watermarks is marked for a few seconds by a bright golden fluorescence, which is absent in the case of artificial watermarks.

Discharge Effects on Tissue Paper

Discharge effects on tissue paper are produced in a very simple manner by passing the tissue paper through the solution of an easily dischargeable dyestuff in the dyeing machine, and spraying or printing on a solution of 1 lb. Hydralite C extra per 1 gal. water to which has been added a solution of 3½ oz. acetate of zinc per 1 gal. water or 1 pint acetate

of alumina of 18° Tw.; the paper is then dried quickly.

Increasing Strength of Paper
U. S. Patent 1,997,487

An absorbent paper is treated with

Glue		6 oz.
Formaldehyde		3 fl. oz.
Water	to make	1 gal.

Transfer Printing Paper
U. S. Patent 1,965,257

Rubber Latex (60%)	40 lb.
Casein	10 lb.
Zinc Stearate	5 lb.
Paraffin Emulsion	50–100 lb.
Formaldehyde (40%)	5 lb.
Triethanolamine	2 lb.
Water	2 lb.

The colored design is printed on this paper by using a dye ink having a composition similar to the following:

Acid Dye	100 lb.
Acetone	300 lb.
Divinyl Resin	150 lb.
Methyl Alcohol	100 lb.
Dibutyl Phthalate	10 lb.
Castor Oil	10 lb.

To assist the transfer of the colored pattern to the silk fabric it is advantageous to have present at the time of pressing a volatile solvent which is capable of dissolving the dye but not the coating composition. For assisting the transference of acid dyes to silk fabric it is found that a satisfactory solvent consists of:

Alcohol (95%)	80 gal.
Acetic Acid (36%)	10 gal.
Water	10 gal.

It is claimed that owing to the resiliency of the rubber coating composition and the special manner of applying the transfer paper to the silk fabric, it is possible to obtain very clear and well-graded impressions on crepe materials.

Fixing Baths

Acid Fixing Bath

	Metric	Avoirdupois
Water	4 l.	128 oz.
Hypo	1160 g.	38 oz.
Potassium Metabisulphite	100 g.	3½ oz.

The metabisulphite should be added only when the hypo solution is cool, not when it is hot.

Chrome Alum Fixing Bath

Solution 1

	Metric	Avoirdupois
Water	2½ l.	80 oz.
Hypo	960 g.	2 lb.
Sodium Sulphite (Anhydrous)	65 g.	2¼ oz.
Water to make	3 l.	96 oz.

Solution 2

	Metric	Avoirdupois
Water (About 150° F.)	1 l.	32 oz.
Potassium Chrome Alum	60 g.	2 oz.
Sulphuric Acid C.P.	9 cc.	¼ oz.

Add solution 2 slowly with constant stirring to solution 1.

Acid Hardening Fixing Bath

Solution 1

	Metric	Avoirdupois
Water	4 l.	128 oz.
Hypo	960 g.	2 lb.

Solution 2

	Metric	Avoirdupois
Water (About 125°F.)	300 cc.	10 oz.
Sodium Sulphite (Anhydrous)	60 g.	2 oz.
Acetic Acid (28%)	180 cc.	6 oz.
Potassium Alum	60 g.	2 oz.

To make 28% acetic acid from glacial acid, dilute 3 parts glacial with eight parts of water.

Dissolve chemicals thoroughly in order given. Cool solution 2 after mixing and add it slowly with constant stirring to solution 1.

A fresh bath should be prepared frequently, as the gelatin-coated backs of the films are likely to become stained in an old or discolored fixing solution. The following Replenisher for two-liter solution of above fixing bath is recommended in cases where the acidity needs to be renewed:

	Metric	Avoirdupois
Water	80 cc.	3 oz.
Sodium Sulphite (Anhydrous)	15 g.	½ oz.
Acetic Acid (28% Pure)	48 cc.	1½ oz.
Potassium Alum	15 g.	½ oz.

Special Fixing Bath for Printon and Reprolith Films

Accuracy in registration for multicolor work being of prime importance, for use in such cases a fixing bath without hardener, as follows is recommended:

	Metric	Avoirdupois
Water	1 l.	32 oz.
Hypo	485 g.	16 oz.
Potassium Metabisulphite	75 g.	2½ oz.

In case this bath should lose its acidity by frequent use, giving the film a yellowish stain, add more potassium metabisulphite to restore the acidity of the solution.

Acid Hardening Fixing Bath
U. S. Patent 1,981,391

Formula No. 1

Sodium Thiosulphate	300 g.
Sodium Sulphite (Desiccated)	15 g.
Propionic Acid	20 g.
Potassium Alum	15 g.
Boric Acid	5 g.
Water	to 1 l.

No. 2

Sodium Thiosulphate	300 g.
Sodium Sulphite (Desiccated)	15 g.
Acetic Acid	15 cc.
Potassium Alum	15 g.
Glycol Borate	10 g.
Water	to 1 l.

No. 3

Sodium Thiosulphate	300 g.
Sodium Sulphite (Desiccated)	15 g.
Boron Triacetate	15 g.
Potassium Alum	15 g.
Water	to 1 l.

No. 4

Sodium Thiosulphate	300 g.
Sodium Sulphite	15 g.
Acetic Acid	15 cc.
Citric Acid	1 g.
Potassium Alum	15 g.
Boric Acid	5 g.
Water	to 1 l.

No. 5

Sodium Thiosulphate	300 g.
Sodium Sulphite	5 g.
Acetic Acid	20 cc.
Sodium Acetate	20 g.
Potassium Alum	20 g.
Borax	20 g.
Water	to 1 l.

No. 6

Sodium Thiosulphate	300 g.
Sodium Sulphite (Anhydrous)	15 g.
Sodium Acetate (Anhydrous)	20 g.
Boric Acid	5 g.
Sulphuric Acid (Concentrated)	5 cc.
Alum	15 g.
Water	to 1 l.

Elon-Hydroquinone Developer
Stock Solution

	Avoirdupois	Metric
Elon	45 gr.	3.1 g.
Sodium Sulphite (Desiccated)	1½ oz.	45 g.
Hydroquinone	175 gr.	12 g.
Sodium Carbonate (Desiccated)	2¼ oz.	67.5 g.
Potassium Bromide	27 gr.	1.9 g.
Water to make	32 oz.	1 l.

Dilute 1 part to 2 parts water for use.

p-Phenylenediamine Developer

p-Phenylenediamine	145 gr.	10 g.
Sodium Sulphite (Desiccated)	1 oz. 290 gr.	50 g.
Water to make	32 oz.	1 l.

p-Phenylenediamine-Glycin Developer

p-Phenylenediamine	145 gr.	10 g.
Glycin	175 gr.	12 g.
Sodium Sulphite (Desiccated)	3 oz.	90 g.
Water to make	32 oz.	1 l.

Fine Grain Developer
Formula No. 1

	Avoirdupois	Metric
Elon	29 gr.	2 g.
Sodium Sulphite (Desiccated)	3 oz. 145 gr.	100 g.
Hydroquinone	73 gr.	5 g.
Borax (Crystals)	29 gr.	2 g.
Water to make	32 oz.	1 l.

No. 2

Sodium Sulphite	60 g.
p-Phenylenediamine	10 g.
Acetone	10 cc.
Sodium Metasilicate	3 g.
Metol	2 g.
Glycin	2 g.
Water to make	2 l.

This is developed for 15 minutes at 65° to 70° F.

Pyrocatechol Developer without Sulphite

a.	Pyrocatechol	4 g.
	Water	100 cc.
	Lactic Acid	10 drops

For contrasty negatives use

a (Above)	10 cc.
Water	100 cc.
Sodium Carbonate Solution (3–4%)	5 cc.

Developer for Film and Paper

Adurol	2 gr.
Sodium Sulphite	8 gr.
Sodium Carbonate	8 gr.
Water	1 oz.

Add not more than ⅕ grain potassium bromide to each ounce of finished developer. With developer at 70° F., films will develop in 4 minutes. Tuma Gas paper should be exposed so that the image will appear in 45 seconds. The print will be fully developed in 2 minutes.

The times for other papers are:

Velour black—image appears in 1 minute; developed in 2½ minutes.

Bromide papers—image appears in 1¼ minutes; developed in 3 minutes.

Warmer tones can be obtained by diluting the developer and giving longer exposure.

This developer will not affect persons subject to aniline poisoning. It oxidizes

quite rapidly and should be kept in a tall, narrow vessel between prints in order to reduce the amount in contact with the air to a minimum.

Gold toner:

Stock Solution

1. Gold Chloride	15 gr.
Water	2 oz.
2. 5% Solution Thiourea (1 oz. to 20 oz. water)	

For use take 4 drams of gold solution, 3 drams thiourea solution, 5 or 6 drops sulphuric acid and one quart of water. Proceed as follows:

Dilute the required amounts of both stock solutions with one pint of water. Pour gold solution into thiourea solution slowly with stirring. Add the acid to the combined solutions.

Compensating Developer with Pyrogallol

Formula No. 1

Water	100 cc.
Pyrogallol	0.3 g.
Potassium Metabisulphite (10%)	3 cc.
Caustic Soda (10%)	2 cc.

No. 2

Water	100 cc.
Pyrogallol	0.3 g.
Potassium Metabisulphite (10%)	12 cc.
Caustic Soda (10%)	5 cc.

Formula No. 1 at 18° C. (5 to 6 minutes) gives a yellow-brown negative.

Formula No. 2 at 18° C. (10 to 12 minutes) gives a neutral gray negative and developer can be used a second time.

Modified Hub No. 1 Formula for Glycerin Developer

Water	1000 cc. or	(1 qt.)
Sodium Sulphite	75 g.	(2½ oz.)
Glycin	25 g.	(375 oz.)
Trisodium Phosphate (Monohydrate)	125 g.	(4⅙ oz.)
Potassium Bromide	3 g.	(45 gr.)

This stock solution keeps well, even in partially filled bottles. For use with chloride and chloro-bromide papers it is diluted with 3 parts of water, and with 4 parts of water for bromide papers. With bromide papers it has been successfully used at temperatures up to 90° F. Because of its high alkalinity, prints developed in this formula should be left in the acid-stop bath for at least 15 or 20 seconds before being placed in the fixer, and the acid-stop bath should be frequently renewed.

Farmer's Reducer

In case of overexposure or overdevelopment, this well-known reducer can be used effectively for clearing. It is easily compounded by making first a 1:4 solution of plain hypo—for example, 8 oz. of hypo dissolved in 32 oz. of water—and adding to this just enough potassium ferricyanide to turn the solution to a lemon-yellow color. Most workers prepare the ferricyanide as a 10% solution in advance, for use as needed; others shake a little of the powder directly into the plain hypo solution. The lemon-yellow color disappears with use of the reducer, but may be restored by adding more ferricyanide. The stronger the color, the stronger the reducing action, and vice versa. If the reducer is used too strong its action is not so easy to control.

The film may be immersed in the reducer solution, after being soaked in water to assure even action, or, in cases where only local reduction is desired, the reducer may be applied to the moist film with a tuft of cotton, with rinsing during inspection and afterwards.

Reversing Reversible Film

(1) First Developer

	Metric	Avoirdupois
Water	1000 cc.	32 oz.
Metol	2 g.	30 gr.
Sodium Sulphite (Anhydrous)	30 g.	1 oz.
Hydroquinone	12 g.	180 gr.
Potassium Bromide	8 g.	120 gr.
Sodium Hydroxide	18 g.	½ oz.
Potassium Sulphocyanate	5 g.	75 gr.

Develop 4 to 6 minutes at 65° F., depending on exposure.

(2) Wash 5 minutes in running water.

(3) Reversing Bath

Water	1000 cc.
Potassium Bichromate	5 g.
Sulphuric Acid (Concentrated)	5 cc.

Normal bleaching time 3 to 6 minutes. Keep in bleaching bath until negative image is completely dissolved.

(4) Wash 5 minutes in running water

(5) Clearing Bath

Water	1000 cc.
Sodium Sulphite (Dry)	50 g.

Clear for 5 minutes.

(6) Wash 5 minutes in running water.

(7) Expose to Mazda light or diffused daylight.

(8) Second Developer.

Water	1000 cc.
Metol	5 g.
Hydroquinone	6 g.
Sodium Sulphite (Dry)	40 g.
Potassium Carbonate	40 g.
Potassium Bromide	6 g.

Develop 5 minutes at 65° F.

(9) Short rinse in running water.

(10) Fixing Bath

Water	1000 cc.
Hypo	300 g.
Potassium Metabisulphite	50 g.

Fix for 2 minutes.

(11) Wash for 30 minutes in running water.

(12) Glycerine Bath

Water	1000 cc.
Glycerin (C.P.)	20 cc.

Leave in glycerin bath for 5 minutes.

(13) Remove water with a soft chamois and dry in a current of warm dry air.

Note: Operations 7 to 13 take place in white light.

Superpan Reversible film can be desensitized before development by immersion in a 1/5000 solution of Pinacryptol Green desensitizer.

Formula "D16" for Chemically Reversing 16 mm. Film

Water (Distilled)	10 gal.
Elon	180 gr.
Sodium Sulphite	3 lb. 5 oz.
Hydroquinone	8 oz.
Sodium Carbonate	1 lb. 9 oz.
Potassium Bromide	1 oz. 63 gr.
Citric Acid	400 gr.
Potassium Metabisulphite	2 oz.

Develop 7–15 minutes at 65° F.

Intensifying Formulas

On some occasions and for certain types of work it may be found desirable to intensify film negatives. In such instances the following formulas will give best results, being desirable for their freedom from stain as well as their effective intensifying action.

Mercury Intensifier:

	Metric	Avoirdupois
Water	1 l.	32 oz.
Mercuric Chloride	10 g.	150 gr.
Potassium Bromide	5 g.	75 gr.

Chromium Intensifier:

This formula gives slightly more vigorous intensification than the Mercury Intensifier above. Prolonged intensification with it, however, leaves the film with a slight yellow color.

	Metric	Avoirdupois
Water	1 l.	32 oz.
Potassium Bichromate	9 g.	135 gr.
Hydrochloric Acid	6 cc.	1.6 dr.

Immerse negatives in this solution until bleached, wash for 5 minutes in running water, and redevelop in a Metol Hydroquinone developer. The negatives should then be given a 15-minute wash before drying.

Some intensifying solutions have been known to cause a slight blue coloration of the base of the film. While this is not harmful and does not prolong the printing time unduly, if preferred, such coloration may be easily removed as outlined in the formula for Washing and Drying.

Monckhoven's Intensifier:

Solution A

	Metric	Avoirdupois
Water	1 l.	32 oz.
Potassium Bromide	23 g.	¾ oz.
Mercuric Chloride	23 g.	¾ oz.

Solution B

	Metric	Avoirdupois
Water	1 l.	32 oz.
Potassium Cyanide	23 g.	¾ oz.
Silver Nitrate	23 g.	¾ oz.

The silver and the cyanide are dissolved in separate lots of water, and the former added to the latter until a permanent precipitate is produced. The mixture is allowed to stand 15 minutes, and after filtering, forms Solution B.

Place the negative in A until bleached through; then rinse and place in Solution B. If intensification is carried too far, the negative may be reduced with a weak solution of hypo.

Because of the deadly poisonous character of this intensifier, it should be used with care and bottles containing it should be suitably marked.

Agfa Mercuric Iodide Intensifier:

	Metric	Avoirdupois
Water	200 to 300 cc.	20 to 30 oz.
Mercuric Chloride (2%)	100 cc.	10 oz.
Potassium Iodide (10%)	25 cc.	2.5 oz.
Hypo (10%)	40 cc.	4 oz.

Part of the mercury solution is added

to the water and then part of the iodide solution, continuing until all the mercury and iodide is added to the water.

When solution is clear, add the hypo. Use full strength.

Mercury Intensifier

This is a satisfactory two-solution intensifier for increasing the printing density of thin, flat negatives. This intensifier has the advantage of not staining negatives as readily as other intensifiers when traces of fixing solution have not been completely removed in washing:

Solution A:

	Metric	Avoirdupois
Water	1 l.	32 oz.
Mercuric Chloride	40 g.	1⅓ oz.

Solution B:

	Metric	Avoirdupois
Water	1 l.	32 oz.
Potassium Iodide	100 g.	3⅓ oz.

Add B to A until the solution clears. Negatives are immersed until changed to a brown color, then washed and redeveloped in a metol-hydroquinone developer such as Agfa No. 64. The intensified negatives need not be fixed, but should be given a 15-minute wash before hanging them up to dry.

Intensifier, Photographic

Mercuric Chloride Solution (20%)	1 fl. oz.
Potassium Iodide Solution (5%)	1 fl. oz.
Sodium Acetate Solution (7%)	1 fl. oz.

Intensifier for Very Weak Negatives

Water	400 cc.
Mercuric Chloride	2 g.
Potassium Iodide	6 g.

Each of the dry ingredients is dissolved in one-half of the water and the two solutions are then mixed. A red precipitate will form at first but will again dissolve, a clear solution resulting.

While the negative attains considerable and rapid intensification, it becomes badly colored and will not last very long. To avoid this, the negative is placed in a solution of sodium sulphite for a period of ½ to 2 hours. It is then washed thoroughly in water.

If the intensification should be too great it may be reduced in a solution of sodium cyanide.

Toning Formulas

Sepia Tones by Redevelopment:

Sepia tones may be obtained in any print by subsequent treatment after the print is ordinarily finished. The print should be thoroughly washed before treatment to produce a sepia tone. It is then immersed in the bleaching bath (Solution No. 1) for about 1 minute, or until the middle tones of the print are just perceptible. It is next rinsed thoroughly in cold water and transferred to the redeveloper. When original detail has returned and the print is of desired strength (this will take about half a minute), remove print, rinse thoroughly, and harden by immersion for 5 minutes in the Hardening Solution specified for use in connection with the Fixing Bath (the Hardening Solution only—no Hypo). Finally, remove the print and wash for 30 minutes in running water.

No. 1—Stock Solution

(Bleacher)

The No. 1 Stock Solution, which is the bleacher, may be made up for either normal sepia tones, warm sepia tones, or cold sepia tones, as folows:

For Normal Sepia Tones:

	Metric	Avoirdupois
Potassium Ferricyanide (10% Solution)	500 cc.	16 oz.
Potassium Bromide (10% Solution)	100 cc.	3½ oz.
Water	400 cc.	14 oz.

For Warm Sepia Tones:

	Metric	Avoirdupois
Potassium Ferricyanide (10% Solution)	600 cc.	19½ oz.
Potassium Bromide (10% Solution)	40 cc.	1½ oz.
Water	360 cc.	12 oz.

For approximately a 10% solution, take 100 grains to 2 fluid ounces of water or 10 grams to 100 cc. of water.

For Cold Sepia Tones:

	Metric	Avoirdupois
Potassium Ferricyanide (10% Solution	300 cc.	10 oz.
Potassium Bromide (10% Solution)	500 cc.	16 oz.
Ammonia (.910)	10 cc.	½ oz.
Water	190 cc.	6½ oz.

No. 2—Stock Solution
(Re-Developer)

	Metric	Avoirdupois
Water	500 cc.	16 oz.
Sodium Sulphide	42.5 g.	1½ oz.

Bleaching Bath for Use.

	Metric	Avoirdupois
Water	500 cc.	16 oz.
No. 1 Stock Solution (Bleacher)	500 cc.	16 oz.

Re-Developing Bath for Use.

	Metric	Avoirdupois
Water	1 l.	32 oz.
No. 2 Stock Solution (Re-Developer)	118 cc.	4 oz.

Important: Be sure to use sodium sulphide, not sodium sulphite, in compounding the re-developer. Also, use clean trays, free from exposed iron spots, especially with Bleaching Bath. Otherwise blue spots may form on prints.

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1. Blue Toner (Iron Bath)

First dissolve:

Potassium Ferricyanide	375 g.
Potassium Bichromate	½ g.

in:

Water	40 l.

and pour this solution into a second one consisting of:

Iron Ammonia Alum	425 g.
Oxalic Acid	500 g.
Water	40 l.

The two solutions must be separately filtered and then mixed at ordinary temperature and with vigorous stirring. They then form a clear yellowish solution without any sign of turbidity, provided the chemicals have been mixed in the correct quantities and with due regard to cleanliness. The time of toning varies according to the tone required.

By treating the toned films in a subsequent weak fixing bath, tones of remarkable clearness are obtained. But it must be expressly noted that, in the case of blue-toned films, the fixing bath must not be used until after a most thorough washing, otherwise a reducing action takes place and detail in the picture is eaten out. The films must be well washed after the second fixing.

2. Uranium Toner (Yellow-Brown)

Dissolve:

Potassium Ferricyanide	500 g.

in:

Water	10 l.

and add:

Potassium Bichromate (1% Solution)	50 cc.

Then add the whole to:

Uranium Nitrate	550 g.
Oxalic Acid	500 g.
Water	40 l.

As in the making up of the iron bath, the two solutions must be separately filtered and mixed at ordinary temperature while stirring well. The result should be a yellowish solution free from deposit. The bath requires to be revivified from time to time during long use by addition of oxalic acid. As much as 1000 g. oxalic acid may be added in all, and so 500 g. of the acid is dissolved in water, and the solution added in small doses from time to time. By this means, staining of the whites, which otherwise takes place after a time, is readily avoided.

3. Copper Toning (Reddish-Brown)

Copper Sulphate	500 g.
Sodium Citrate	2500 g.
or	
Potassium Citrate	2250 g.
Water	30 l.

To the above add:

Potassium Ferricyanide	400 g.
Water	20 l.
Potassium Bichromate (1% Solution)	50 cc.

In making up this bath also, the separate solutions must be filtered, and carefully and well mixed at the ordinary temperature.

The following observations apply to the use of Baths Nos. 1 to 3.

As is well known, a solution of potassium ferricyanide in water, in conjunction with hypo, acts as a reducer, viz.: the Farmer reducer. Thus a film which contains only traces of hypo, on being introduced into the toning bath, undergoes a reducing process along with the toning which is aimed at. There are also two conditions which should be invariably observed if it is desired to carry out the toning processes successfully and to keep the toning baths in good conditions:

1. For all toning processes—and this applies also to tinting—frames should be kept for these operations only; frames which have been employed for the development or fixation of prints should on no account be used.

2. Positive film which is to be toned must be especially well washed. In order to ensure that this is the case and to be

certain that the film is in the necessary state of uniformity, it is advisable to wash the film for a further few minutes immediately before toning.

Wet Collodion Continuous-Tone Negative

Plain Collodion	10 g.

To the above add 1 g. of following:

Alcohol	1 l.
Cadmium Iodide	80 g.
Ammonium Iodide	40 g.
Cadmium Bromide	10 g.
Calcium Chloride ($6H_2O$)	10 g.

Re-development increases the opacity if done before fixing and increases the contrast if done after fixing.

Prevention of Haze in Prints
German Patent 594,712

The formation of haze is prevented and a blue-black tone imparted to the prints, by adding triazole or tetrazole solution to the emulsion layer or to the developer. Thus, 0.5 to 5 cc. of a 1:100 benzotriazole solution is added to a usual metol-hydroquinone developer.

Control of Photographic Contrasts

M.

Potash Metabisulphite	160 gr.
Metol	160 gr.
Soda Sulphite	¾ oz.
Potash Bromide	25 gr.
Water	to 10 oz.

Q.

Potash Metabisulphite	160 gr.
Hydroquinone	160 gr.
Soda Sulphite	¾ oz.
Potash Bromide	40 gr.
Water	to 10 oz.

A.

Soda Carbonate	6 oz.
Water	to 20 oz.

These are concentrated solutions that will keep indefinitely if properly compounded and are diluted for use. In the M and Q solutions the potash metabisulphite should be added to about three-fourths of the water first and partially dissolved, it is not necessary that it should be fully dissolved at this stage, just a good shake up to drive off the oxygen from the water, then the metol or hydroquinone added and fully dissolved before the soda sulphite is added.

For use the M and Q solutions are used either separately or in any proportion desired and an equal volume of the A solution added and then diluted with 3 times the volume of water.

For example, for a normal developer take 1 part of M, 4 parts of Q and 5 parts of A diluted with 15 parts of water. The quantity of water can be varied to suit the particular brand of plate in use, some plates will stand twice this quantity of water. It is a matter of experience.

For positives from very flat negatives the Q solution plus A may be used alone, or a small quantity of M such as 1 of M to 10 or 12 of Q. From very hard negatives the M plus A alone can be used or with a small proportion of Q and, of course, the necessary dilution in each case.

With a high proportion of M to Q the image will appear quickly, but will require time to gain sufficient density. With a high proportion of Q to M the image will appear slowly, but gain density more rapidly in proportion so that the total developing time does not vary so much as would appear at first sight.

To those who have to handle this class of work, either for color half-tone or for photogravure, this system of working is recommended and when once mastered it becomes a very adaptable servant.

Re-Etching Half-Tones with Enamel Off

As in all etching, cleanliness and freedom from grease in the plate to be treated is the first consideration, but any enamel still remaining on the dots is to be left. (This applies to the places to be rolled as well as those where the enamel is good.)

A viscid solution of gum and process white is next prepared:

Gum Arabic	5 oz.
Water	5 oz.

and when required, to every three parts of this solution, mix one part process white.

The plate after being rinsed with water to replace the air between the dots is allowed to drain (not dry) and the gum solution painted over the whole surface. The edge of a wooden rule is next wiped or scraped over the surface in such a way that only the thinnest layer of gum is left on top of the dots leaving the thick gum remaining between them. A word of warning—should the gum become somewhat thin owing to its application to a wet plate the process must be repeated. Also do not put the gum on a dry plate as it would then be impossible for it to replace the air between the dots. After applying the gum it is dried, using as little heat as possible.

A piece of charcoal having on one of its sides a perfectly flat area of about 1 inch, is now required for rubbing the gum off the surface of the plate, and must be used dry. This flat side is put in contact with the gummed surface and with an even and gentle pressure the gum is rubbed away from the whole surface, or if only to be treated locally, from those parts which are to receive the new ink top. It will be found that very little rubbing is required to remove the gum in the high-lights, while this increases somewhat with the strength of the tone. Rubbing is continued until the metal appears bright and clean, removing any enamel that remains on the areas to be rolled at the same time. If this is carried out properly any increase in tone values owing to the rubbing of the charcoal is negligible, and cannot be seen on a graded strip although etched down beside enamel receiving identical treatment. The gum is now remaining at the sides and between the dots untouched, and the powdered charcoal must be lightly dusted off the surface with cotton wool.

It will be noticed that the white gum between the dots is discolored by the charcoal but this does not matter as in other respects it is quite unaffected. At this stage the roller and ink must come under consideration and these contrary to the usual rule are quite easy to prepare and use. The roller used is a good quality composition roller, and the ink is stone to stone re-transfer ink, both ink and roller are the same as used by line metal printers. Thin the ink with a little pure turpentine in the center of the slab and then evenly distribute the ink over roller and slab. The amount of ink when ready for rolling should be such that it is still possible to see the color of the slab through the ink. The condition of the ink should be just tacky. In rolling up the plates no extra pressure is required, the weight of the roller itself usually being found sufficient. When the whole surface of the plate has received an even layer of ink it is dusted over with fine bitumen powder. This dusting must be done lightly and thoroughly with the aid of cotton wool.

The plate should now be soaked in water for about 2 minutes to soften the gum, but soaking only will not bring it away from between the dots, as a certain amount of force is necessary in the form of a spray of water. The spraying can be done by turning the tap on full and putting the thumb in a position so as to make the water into a narrow beam of as much force as possible, and this is directed all over the surface of the plate, dwelling particularly on those parts (if any) where the gum appears somewhat reluctant to leave, such as a strong cross-line tint. Should any difficulty be experienced in cleaning away ink-covered gum from between the dots, the fault can usually be traced to the gum solution being too thin, or to its imperfect application, but in any case do not attempt other means of removing the gum, such as rubbing with cotton wool, as this will certainly weaken the new top.

After spraying the plate is drained and dried off over the gas with gentle heat, making sure that all moisture is removed before burning-in hard. The temperature reached during the fusing or burning-in of the bitumen and ink should be almost sufficient to burn-in enamel. The required temperature can be judged quite easily in copper by the discoloration of the metal: it turning from an orange to a bluish color when approximately the temperature is reached. In zinc there is no discoloration of the metal, but one way to assist the judgment is to paint the back of the plate with shellac and when during the burning-in this turns a dark brown shade, the ink is burnt in.

Burning-in operations completed, the plate, either copper or zinc, is ready for etching as soon as it becomes cold, and it can be chalked with magnesia, staged and treated as though the dots had the original enamel top. One precaution is necessary and that is to take care they are not immersed for any length of time in the acetic and salt bath other than that required to remove the magnesia, as this has a weakening effect on the ink. It is better to dispense with acetic and use a weak solution of nitric acid such as 1 part acid to 20 parts water.

When etching is completed it is sometimes found difficult to remove the ink top even though turpentine and a brush is used, in which case a light rubbing with charcoal will be found the most satisfactory.

Photolithographic Deep-Etched Plates

A fine-grained zinc plate is washed with 5% acetic acid and water, then coated with 1000 cc. of water, 133 cc. of photo-engraver's glue, 100 cc. of 20% ammonium bichromate solution, 20 cc. of ammonium hydroxide at 22° Bé. At 30% relative humidity, the exposure is twice as long as at 60%. The sensitized plate keeps 6 hours at 45 to 50% humidity or 24 hours at 40%. After development in

cold water, the plate is treated for 10 to 15 seconds in hydrochloric acid diluted with 200 parts of water, washed, and dried. Before drying, the image may be dyed in a 2% solution of direct black 2N extra concentrated, or oxydiazol black NJEE. Etching the plate in denatured absolute alcohol to which are added 50 cc. of concentrated hydrochloric acid per liter, for 2 minutes, produces a depth of about 0.0075 mm. The plate is rinsed with alcohol, dried, washed out with asphaltum and liquid reversing ink, and talcked. It is then swabbed with water and in 1000 cc. of water, 400 cc. of 10% barium chloride solution, and 50 cc. of 10% sodium hydroxide solution. Removal of the glue image takes from 5 to 10 minutes. This batch is patented in the United States: 60 cc. of 12 to 14° Bé. Gum arabic solution may be added. After washing with water the plate is bathed for 10 to 15 seconds in very dilute hydrochloric acid, then rinsed in hot water. The plate is next gum-etched and sent to the press.

Photoengraving Enamel
U. S. Patent 2,000,453

Glue 20 oz., ammonia solution 2 oz., chromic acid 1.5 oz., and alcohol about 64 oz. are used together.

Planographic and Offset Plates
British Patent 421,217

Aluminum plates are made anodes in 0.3–5% nitric for 10 to 30 minutes at a current density of 1 to 2 amperes per square decimeter; zinc plates are made the anode in a saturated potassium carbonate solution for 10 to 30 minutes at a current density of 2 to 3 amperes per square decimeter.

Photographic Masking Paste

Glycerin	1 gal.
Whiting	3 lb.
Neutral Soft Soap	1 lb.

Masking paste must be so formulated as to have sufficient solids or bodying agents that it will not flow down or cause breaks in the film; also it must be capable of being brushed on to form a clean sharp edge. The proportion of glycerin must be sufficient to keep the film from drying up under exposure for at least 48 hours.

Photograph Paste

Gelatin (Photo)	4 oz.
Water	16 oz.

Soak, dissolve on a water-bath, and add when somewhat cooled:

Glycerin	1 oz.
Wood Alcohol	5 oz.

Mix.

Mounting Translite Prints on Glass

Dissolve 1 oz. of gelatin in 6 oz. of boiled water. After the gelatin has been thoroughly dissolved, add 1 oz. chloral hydrate. Apply the solution to the glass with a brush, coating the glass evenly. Then apply Translite print, wet, face side to the glass. Squeegee with a print-roller until all the surplus gelatin has been removed and air-bubbles are all out. Then allow to dry. This formula will withstand heat more than any other starch or glue formulæ.

Photographic Dry-Mounting Tissue
U. S. Patent 2,017,144

A paper mounting tissue is coated on both sides with a composition containing low-viscosity nitrocellulose 100, tritolyl phosphate 110–150 and a resin such as shellac 10–200 parts.

Blue for Drawings

Saturate 10 g. of oxalic acid in a little water with ferric hydroxide, filter off excess of ferric hydroxide, add concentrated solutions of 27 g. sodium oxalate and 11.6 g. sodium ferrocyanide, apply the mixture to paper with a brush and dry in a dark room. Develop the prints with dilute hydrochloric acid or sulphuric acid.

Waterproof Coating for Wooden Photographic Trays

Formula No. 1

Methyl Alcohol	500 cc.
Orange Shellac	100 g.
Rosin	25 g.
Venice Turpentine	25 g.

The ingredients are heated on a water-bath until completely dissolved.

No. 2

One part of gutta percha and one part of paraffin are melted together. When cool, this mixture is dissolved in sufficient benzine to make a mixture of paint-like consistency.

Cleaning Porcelain Photographic Trays

Water	100 cc.
Potassium Cyanide	10 g.
Iodine	3 g.

This is a very satisfactory solution for removing stubborn stains.

Flashlight Powder

Formula No. 1

Potassium Chlorate	20 g.
Powdered Magnesium	10 g.

The potassium chlorate must first be finely pulverized (to avoid spattering on ignition). It is then carefully mixed with the magnesium. It is preferable to mix this in small quantities on a glass plate, as this mixture is very explosive and a pestle and mortar may prove extremely dangerous.

No. 2

Powdered Magnesium	10 g.
Potassium Dichromate	10 g.

This powder is designed to burn from ¼ to ¾ second.

No. 3

Powdered Magnesium	1 g.
Ammonium Nitrate	0.8 g.

The above should be mixed just before using, the ammonium nitrate being kept in an absolutely dry state. This is a very brilliant and ashless powder and the quantity designated is sufficient for good illumination of a room 15 ft. sq.

Magnesium Flashlight Powder

German Patent 592,898

Potassium permanganate, potassium nitrate and sulphur are among the ingredients of a new type of magnesium flashlight powder composition which can be ignited without detonation in cartridges through the medium of a percussion cap. 700 to 900 parts of magnesium are admixed with sulphur (10 to 18), potassium permanganate (100 to 140), potassium nitrate (70 to 85), magnesia (100 to 160) and wood charcoal (10 to 30).

Plating on Aluminum

The following formulæ for plating nickel on roughened aluminum are recommended by the Aluminum Co. of America:

Grease is first removed from the surface by immersion in a solution containing:

Sodium Carbonate	1 to 3 oz./gal.
Trisodium Phosphate	1 to 3 oz./gal.

Temperature about 200° F.

The article to be plated is next rinsed in water and then preferably immersed in 5% hydrofluoric acid solution for about 15 seconds to remove the last traces of alkali and prepare for the etching solution.

The etching solution depends on the chemical composition of the metal.

Formula No. 1

For etching commercially pure aluminum use:

Nickel Chloride	36 oz.
Hydrochloric Acid (sp. gr. 1.18)	0.2 gal.
Water	1 gal.

Temperature 90° F.

The dipping time should be determined by actual trial. It approximates a half-minute.

No. 2

For etching aluminum alloys containing copper, manganese, and perhaps magnesium use:

Hydrochloric Acid (sp. gr. 1.18)	⅓ gal.
Water	⅔ gal.
Manganous Sulphate	½ oz.

Temperature 90° F.

The dipping time should be determined by actual trial. It approximates a half-minute.

No. 3

For etching aluminum castings use:

Nitric Acid (sp. gr. 1.42)	3 fl. oz.
Hydrofluoric Acid (48–52%)	1 fl. oz.

Temperature 75–80° F.

The dipping time should be determined by actual trial. It approximates a half-minute. The container for this etching solution should be lead lined and coated with the following mixture:

Beeswax	1 oz.
Paraffin	4 oz.

After etching the articles, they should be well rinsed in water, after which they may be plated in a nickel bath of formula given in Volume II.

Anodic Treatment of Aluminum

The aluminum or aluminum alloy is made the anode in a chromic or sulphuric acid solution, and 10–100 amperes per square foot is passed through for 10–20 minutes.

Formula No. 1

The chromic acid solution contains 5–15% chromic acid. The current density for this bath varies from 10 amperes per square foot to 100 amperes per square foot. The temperature of this bath is important and should be kept between 90–100° F.

Fumes of chromic acid develop as the process continues. A ventilating system should be in operation at all times as the fumes are injurious.

No. 2

The sulphuric acid method consists of anodizing the aluminum or its alloy in a solution containing 5–60% sulphuric acid by volume. The current density varies from 10 to 25 amperes per square foot. The temperature control is not as important as in the chromic acid solution.

Sulphuric acid spray is released during the process, and for this reason the bath should have a ventilating system applied to it.

After the work has been removed from the solution, it is essential to wash with water until all traces of sulphuric acid or chromic acid have been removed. For this purpose two rinses in running water for 10 minutes each will suffice.

Anodic Coating of Aluminum

Formula No. 1

British Patent 427,308

The electrolyte consists of an acid to which a glucoside or hydrolyzed glu-

coside has been added. A suitable bath consists of 100 l. sulphuric acid of sp. gr. 1.220 to which is added 300 g. baptisin or 500 g. hydrolyzed barbaloin. Alternatively, 500 g. trihydroxymethylanthraquinone as obtained from the hydrolysis of frangulin may be added.

No. 2

British Patent 429,344

Caustic Soda	20 g.
Water	1 l.
Glycerin	150 cc.

In place of the glycerin any one of the following may be used:

Formaldehyde	75 cc.
or	
Lactose	90 g.
or	
Barbaloin	50 g.

Operate at 10–15 volts; current density 18–24 amperes per square foot at 15–25° C.

Coloring Aluminum

If anodized aluminum is placed in a solution of an organic dye, the dye unites with the coating formed on the aluminum and forms a colored lake. These colors will not wash out. Thus, by dipping anodized aluminum in a green dye solution, a green coating is obtained. In this way any desired color can be obtained.

Formation of Noncorrosive Film on Aluminum, Magnesium or Their Alloys

Japanese Patent 109,261

Aluminum, magnesium or their alloys are boiled in a solution of 25 g. of ammonium molybdate and 25 g. of ammonium tartrate per liter.

Antimony Plating

Antimony Oxide	60 g.
Hydrofluoric Acid	114 g.
Water	1000 cc.
Aloin	¼ g.
Clovel Oil	⅛ g.

The mixture should be stirred until solution of the oxide is complete. A lead vessel can be used. Vessels of these materials or of wax can be used as containers for the final plating bath. Wax vessels cannot be used in the making of the bath due to heat of the reaction. A cast antimony anode is used. This bath must be electrolyzed for several days, perhaps to eliminate impurities, before good deposits can be obtained.

A current of 0.8 ampere per sq. dm. (7.4 amperes per sq. ft.) can be used. Higher currents give less smooth deposits. Deposits can be made any thickness even 1 cm. (0.4 in.) or more. The current efficiency at the cathode is practicaly 100%.

Brass Plating

Copper Cyanide	4.2 oz. per gal.
Zinc Cyanide	1.5 oz. per gal.
Sodium Cyanide	6.7 oz. per gal.
Sodium Carbonate	4 oz. per gal.
Ammonium Hydroxide	0.12 oz. per gal.

Use brass anodes and 2–4 amperes per square foot.

Bronze Electroplating Bath

British Patent 412,277

Copper Cyanide	40 g.
Sodium Stannate	20 g.
Sodium Cyanide	35 g.
Caustic Soda	5 g.
Water	to make 1 l.

Brass and Bronze Solutions

Brass Solution:

Copper Cyanide	4 oz.
Zinc Cyanide	1 oz.
Sodium Cyanide	6 oz.
Sodium Carbonate	2 oz.
Water	1 gal.

Temperature 90° F. Cathode current density 2.5 to 3 amperes per sq. ft.; 2 to 3 volts. Use rolled anodes, 80% copper, 20% zinc.

Bronze Solution:

Copper Cyanide	4 oz.
Zinc Cyanide	½ oz.
Sodium Cyanide	5 oz.
Sodium Carbonate	2 oz.
Rochelle Salts	2 oz.
Water	1 gal.

Temperature 95° F. Cathode current density, 2 to 2.5 amperes per sq. ft.; 2 to 3 volts. Rolled bronze anodes, 90% copper, 10% zinc.

Cadmium Solution:

Sodium Cyanide	9 oz.
Cadmium Oxide	3 oz.
Caustic Soda	2 oz.
Water	1 gal.

Temperature 80° F. Cathode current density, 8 to 10 amperes per sq. ft.; 2 to 2½ volts. Use iron and cadmium anodes,

one iron to three cadmium. Remove cadmium anodes when solution is not in use.

Cadmium Plating Bath

Formula No. 1

Cadmium Oxide	3 oz. per gal.
Sodium Cyanide	10 oz. per gal.

No. 2

Cadmium Oxide	39.4 g.
Potassium Cyanide	128.2 g.
Sodium Sulphate	50 g.
Nickel Sulphate	1 g.

Cadmium-Zinc Alloy Plating

Satisfactory deposition is possible from solutions containing 55–75 g. of zinc, 5–30 g. of cadmium, 3–6 mg. of gelatin or caffeine, and 15–20 g. of aluminum sulphate per liter, operated at 25° with pH 4 and current density 1–2 amperes per square decimeter. The cadmium content of the alloy is increased by rotating the cathode and raising the temperature and is decreased by raising the current density, increasing the acidity, and using addition agents and salts. Complex organic nitrogen addition compounds, e.g., caffeine and aloin, have a selective effect, retarding cadmium deposition and thus permitting the cadmium of the bath to be increased. Alloys containing 45–55% of zinc show most resistance to corrosion by aqueous sodium chloride.

Cadmium Plating Die Castings

Scratch brush raw die casting wet or if rough, polish first. Articles are then cadmium plated and given either a dry or wet scratch brush for desired finish. Lacquer to protect finish. Satisfactory deposits may be obtained from the following solution:

Sodium Cyanide	7 oz./gal.
Cadmium Oxide	3 oz./gal.
Potassium Hydroxide	2 oz./gal.

Temperature 113° F.
Current density 10–25 amp. per sq. ft.

Any patented brightener may be used. Strip, 10% ammonium nitrate.

Chromium Plating

The chromic acid salt to be used should consist (according to British Standard Specification) of

Chromium Trioxide (CrO_3)	99.5 %
Sulphate (as Sulphuric Acid)	0.2 %
Chlorides (as Chlorine)	0.05%
Insoluble Matter	0.15%

and the solution made up of 250–500 g. per liter, with a density of 25 to 27° Bé. Sulphate is added in a proportion of 1/100th of the chromic acid concentration; with too high amount of sulphate, current and throwing power fall off badly. Fluoride may be substituted for sulphate, calcium fluoride 30 g./l. in a 500 g./l. solution gives good results.

The solutions should be made up very carefully; usually the bath works best when aged artificially. The tank for the solution (of glass, wood, lead-lined metal) should be arranged for heating as temperature is a critical condition; 40° C. (100° F.) is usually applied, sometimes 60° C. (140° F.) may be required, while for thick, dull deposits cold solution can be used.

Anodes are of lead or lead-antimony alloy; the latter is less affected when the bath is not operating. Current density is very important; for bright deposits on nickel 150 amperes per sq. ft., for thick deposits 300–400 amperes per sq. ft. are used. The high current density requires a particularly careful suspension of the work in the bath, thin wires as in other plating practice are out of the question; very often special jigs are used. In certain cases, where the work is rather large, auxiliary anodes of lead or iron are arranged to insure a good deposit inside a hole, recess, etc. Degreasing in trichloroethylene, polishing and nickel-plating before chromium plating is desirable. Careful subsequent treatment is essential to avoid corrosive effects of eventually remaining bath solution; repeated rinsing alternately in hot and cold water, drying in an oven or hot sawdust is necessary.

Chromium Plating Bath

Chromium Oxide (Free from Sulphuric Acid)	350 g.
Potassium Fluoride	3 g.
Water	1000 cc.

Run at 18–20° C., using 3.8 to 4 volts.

Chromium Solutions

Formula No. 1

Chromic Acid	33 oz.
Sulphuric Acid	0.3 oz.
Water	1 gal.

Total sulphate (from both the chromic acid and the sulphuric acid) should be 0.3 oz.

Temperature 113° F. Cathode current density 125 to 1750 amperes per sq. ft.

No. 2

Chromic Acid	55	oz.
Sulphuric Acid	0.55	oz.
Water	1	gal.

Total sulphate (from both the chromic acid and the sulphuric acid) should be 0.55 oz.

Temperature 95° F. Cathode current density 75 to 125 amperes per sq. ft.

The anodes and temperature control coils should be of 6% antimonial lead. The chromic acid tanks should be of steel, lined with 6% antimonial lead.

No. 1 is used where heavy deposits are desired.

No. 2 is used where the deposit is for decorative purposes.

Cobalt Plating Bath
British Patent 427,458

Cobalt Chloride	40–150 g.
Sodium Acid Fluoride	10–40 g.
Ammonium Chloride	15–60 g.
Cobalt Basic Acetate	15–60 g.
Water	to make 1 l.

Copper Solutions
Cyanide Copper Solution No. 1

Copper Cyanide	3½	oz.
Sodium Cyanide	4½	oz.
Carbonate of Soda	2	oz.
Hyposulphite of Soda	1/64	oz.
Water	1	gal.

No. 2

Copper Carbonate	5	oz.
Sodium Cyanide	10	oz.
Hyposulphite of Soda	1/64	oz.
Water	1	gal.

Either solution should be operated at 100° F. to 110° F. Cathode current density 4 to 6 amperes per sq. ft.; 1½ to 2 volts. Use rolled copper anodes.

Acid Copper Solution

Copper Sulphate	28 oz.
Sulphuric Acid	3 to 5 fl. oz.
Water	1 gal.

Temperature 75° F. Cathode current density for still solution 10 to 15 amperes per sq. ft.; ¾ to 1 volt. Agitation of the cathode or of the solution allows the use of higher current density. Use rolled copper anodes.

Coppering by Immersion

Copper Sulphate	1 to 2 oz.
Sulphuric Acid	½ to 1 oz.
Water	1 gal.

Where only a very thin film of copper is desired the above solution will give good results.

Acid Copper Plating

Cupric Sulphate	27 oz. per gal.
Sulphuric Acid	7 oz. per gal.

Use brass anodes and a current density of 20–40 amperes per sq. ft.

Cyanide Copper Plating

Copper Cyanide	4 oz. per gal.
Sodium Cyanide	5.5 oz. per gal.
Sodium Carbonate	5 oz. per gal.

Use at 35° C. at 13 amperes per sq. ft.

Blue Dip (for Plating Copper and Brass Articles)

Bichloride of Mercury	½ oz.
Sodium Cyanide	6 oz.
Ammonium Chloride	1 oz.
Water	1 gal.

Fluoride Bath

	g.		
Antimony Oxide (Commercial)	60	8	oz.
Hydrofluoric Acid (Commercial, 48%)	114	15.3	oz.
Water	1000	1.6	gal.
Aloin	0.25	0.033	oz.
Clove Oil	0.012	0.0016	oz.

The last two constituents, the so-called addition agents, are used up during the plating; hence, they must be added regularly to the bath. The quantities given above are sufficient for about 12 hours of operation.

Immersion Gold Solution

Fulminate of Gold	4 dwt.
Yellow Prussiate Potash	24 oz.
Carbonate of Soda	12 oz.
Caustic Soda	¼ oz.
Water	1 gal.

Solution should be boiled in a cast iron tank for an hour and allowed to cool to 180° F. before using.

Salt Water Gold

Yellow Prussiate of Potash	64 oz.
Sodium Phosphate	32 oz.
Sodium Carbonate	16 oz.
Sodium Sulphite	8 oz.
Gold as Fulminate	12 dwt.
Water	4 gal.

Solution is boiled for one hour, then

diluted with water to make 4 gal. of solution. The solution is placed in a porous pot which is put in a tank that contains a saturated solution of sodium chloride heated to 190° F.

Green Gold

Metallic Gold as Fulminate or Cyanide	4 dwt.
Silver Cyanide	¼ dwt.
Sodium Cyanide	2 oz.
Carbonate of Soda	2 oz.
Water	1 gal.

Temperature 105° F.; 2 volts; 18 karat green gold anodes.

Rose Gold

Yellow Prussiate of Potash	4 oz.
Potassium Carbonate	4 oz.
Sodium Cyanide	¼ oz.
Gold as Fulminate	10 dwt.
Water	1 gal.

Temperature 175° F.; 6 volts. If a red color is desired, add small quantity of copper carbonate.

Coating Iron with Lead and Tin

Iron and steel can be coated electrolytically after pickling with sulphuric acid, in a bath of tin borofluoride, lead borofluoride and borofluoric acid with acid-proof layers of a lead-tin alloy which are so elastic that the metals can still be worked mechanically; the temperature must, however, not rise above 150 to 200° C., as otherwise the coatings would melt. The deposits are made at a current density of 0.5–3.0 amperes per sq. dm.

Electrolytic Burnishing of Iron

Oxidize anodically in 20 to 40% caustic soda at 1 to 6 amperes per sq. dm. at 1 to 2 volts at 60–70° C.

Thin Deposits of Iron

Dissolve 16 oz. of ammonium chloride in each gallon of water. Connect up tank, same as for plating, using cold rolled iron for anodes. On the cathode rod suspend some old plating racks or other work, and work solution with highest current density obtainable. After 4 or 5 hours of work of the solution, there will be enough iron dissolved from the anodes and the solution will produce a deposit of iron. Operate solution at 80° F.; 1.5 to 2 amperes per sq. ft.; 1 volt.

Iron Solution

Ferrous Chloride	40 oz.
Calcium Chloride	20 oz.
Water	1 gal.

Temperature 200° F.; current density 40 to 50 amperes per sq. ft.; 2 to 2½ volts; pH 1.5 to 2; pure iron anodes.

This bath is used to produce heavy deposits of iron.

Preparing High-Speed Steels for Plating

In order to secure good adhesion of electro-deposits to high-speed steel it is treated anodically at 2.7 amperes per sq. dm. in a bath containing 115 g. of caustic soda and 15 g. of citric acid per liter until gas evolution is uniform over the whole surface, then rinsed with water, dipped momentarily in 6–12*N*-hydrochloric acid and finally washed with water.

Electrodeposition of Lead

Fifty grams of lead perchlorate and 10 g. perchloric acid in 1 liter electrolyte and a current density of 0.25–0.50 amperes per square decimeter are recommended for the preparation of pure 0.1 mm. deposits of lead of good texture. Agitation of the bath permits a higher current density and thicker deposits. Addition of 0.2–0.4 g. peptone and moderate agitation improve the deposit and allow a current density of 1 ampere per square decimeter. Higher current densities up to 2 amperes per square decimeter require constant and efficient stirring and heating up to 60° C. permits 3–4 amperes per square decimeter. For technical purposes 1 ampere per square decimeter is recommended.

Lead Solutions

Lead Carbonate	20 oz.
Hydrofluoric Acid (50%)	32 oz.
Boric Acid	14 oz.
Glue	0.025 oz.

Place the hydrofluoric acid in a lead-lined tank and add the boric acid with constant stirring. When the boric acid is completely dissolved, the solution is allowed to stand until cool, when the lead carbonate is added in the form of a paste with water. The solution is allowed to settle in the plating tank. The solution is then diluted to the proper volume with water and the glue added after dissolving the same in warm water. Mechanical agitation of the solution is essential.

A cathode current density of 10 to 20 amperes per sq. ft., 3 to 4 volts, and lead anodes are employed.

Thin Deposits of Lead

Carbonate of Lead	2 oz.
Caustic Soda	6 oz.
Water	1 gal.

Lead anodes. Temperature 175° F.; 3 to 4 volts.

Coating Magnesium and Its Alloys
French Patent 766,685

Magnesium or an alloy thereof is coated by introducing it into a rotating drum along with an alloy of zinc (25) and cadmium (75 parts) and some galvanized iron turnings. The drum is heated to about 290° C., when the alloy becomes pasty, and is rotated for about 3 minutes.

Commercial Nickel Plating

The three principal methods of nickel plating, i.e., ordinary plating in the stationary bath, rapid plating and barrel plating are discussed and compared as to their respective economic advantages. In all methods it is necessary that new nickel sulphate be continuously formed at the anode and that the deposit be fine in grain. The deposit must permit of mechanical working without injury. The deposit if chromium plated must not peel. The composition of an ordinary stationary bath consists of 75 g. nickel ammonium sulphate in one liter water with a pH of about 5.8; increasing the latter to 6.4 increases, reducing it to 4.6 decreases the throwing power of the bath. Specific gravity is 6–7° Bé., the current density 0.3 ampere per square decimeter, voltage 3.5, temperature 18° C. A thickness of 0.025 mm. is obtained in 7 hours. A rapid plating bath must work at 50°, the grain of such deposit is the finer, the better the electrical conductivity of the bath. The compositions used are: 240 g. nickel sulphate, 30 g. boric acid, 19 g. potassium chloride in 1 liter water; or 240 g. nickel sulphate, 120 g. magnesium sulphate, 30 g. boric acid; or 240 g. nickel sulphate, 30 g. boric acid, 150 g. magnesium sulphate, 10 g. sodium chloride, 50 g. sodium sulphate, 0.1 g. sodium fluoride in 1 liter water. The current density must be adapted to the kind of ware to be plated. Pure nickel anodes do not dissolve as easily as 98% nickel anodes. If the deposition velocity is too high, an excess of oxygen is formed at the anode, passivates it and finally nickel bisulphate and peroxide are formed without nickel going into solution. Plating in the barrel requires a pH of not less than 6.6, at 8–12 volts, time usually 2 hours, bath temperature 35–50°.

Nickel Solutions

Nickel Solution for Brass, Copper, and Cold Rolled Steel

A nickel solution that has been used with good results on brass, copper and cold rolled steels is made as follows:

Formula No. 1

Double Nickel Salts	8 oz.
Single Nickel Salts	4 oz.
Boric Acid	2 oz.
Sodium Chloride	2 oz.
Water	1 gal.

Solution to be operated at 80° F.; 2 to 2½ volts; 6 to 8 amperes per sq. ft. and a pH of 5.8.

For solutions that are operated at a higher temperature and a correspondingly higher current density, use:

No. 2

Double Nickel Salts	8 oz.
Single Nickel Salts	8 oz.
Sodium Chloride	3 oz.
Boric Acid	3 oz.
Water	1 gal.

Temperature 110° F.; 2½ to 3 volts; 20 amperes per sq. ft., and a pH of 6; depolarized nickel anodes 99% plus. Replenish by the addition of single nickel salts.

Low pH Solution for Heavy Deposits of Nickel

No. 3

Single Nickel Salts	32 oz.
Sodium Chloride	6 oz.
Boric Acid	4 oz.
Water	1 gal.

Nickel Strip

Sulphuric Acid	4 oz.
Water	1 oz.

Temperature 80° F.; lead cathodes; 6 volts. If 3 or 4 oz. of copper sulphate per gallon are dissolved in the water before adding to the acid, the strip will not attack the base metal so readily.

Nickel Brighteners

Bright deposits of nickel are obtained from No. 1 formula above by the use of cadmium chloride or one of the prepared brighteners that are on the market. The pitting of nickel deposits is eliminated by adding hydrogen peroxide to the bath. Use from 1 to 5 cc. of 100 volumes peroxide to each gallon depending upon the severity of the pitting.

Nickel Plating

The nickel content of the bath is about 40–50 g. per liter; current density 0.3–0.4 amperes per square decimeter while for rapid plating methods 1–3 amperes per square decimeter are employed. The bath is stirred and the pieces are moved to avoid streaks on the deposit, pH is 5.8–6.2. For rapid nickel plating the following bath is recommended: pure nickel sulphate 22.5 kg., pure ammonium sulphate 2.0 kg., pure nickel chloride 0.5 kg., pure sodium perborate 0.5 kg., water 100 liters 35–40° C., voltage 2.75–3.5.

Hydrogen Poor Nickel Plating

Nickel sulphate 80 g., nickel fluoride 8 g., sodium chloride 1 g., sodium sulphate 0.5 g., sodium nitrate 0.02 g., sulphosodium-phenolate 0.12 g., sodium citrate 2 g., boric acid 6 g., zircon-ammonium fluoride 0.2 g., all in 1 liter water. The ammonium fluoride binds the hydrogen and the deposits adhere well to the base. The voltage employed with this bath is 2 volts.

White Nickel Plating

Formula No. 1

(Low Metal Bath)

Nickel Sulphate	12 oz. per gal.
Ammonium Chloride	2 oz. per gal.
Boric Acid	2 oz. per gal.
pH = 5.4	

Use at room temperature with nickel anodes, and 10–20 amperes per sq. ft.

No. 2

(High Metal Bath)

Nickel Sulphate	34 oz. per gal.
Nickel Chloride	4 oz. per gal.
Boric Acid	4 oz. per gal.
pH = 5.3	

Use nickel anodes and a current density of 15–45 amperes per sq. ft. with a temperature of 50–60° C.

Nickel Bath for Die Castings

Nickel Sulphate	7 oz. per gal.
Ammonium Chloride	2 oz. per gal.
Boric Acid	2 oz. per gal.
Sodium Sulphate	12 oz. per gal.
Sodium Citrate	3 oz. per gal.
pH = 5.5	

Temperature, 20–30° C.; current density = 15–30 amperes per sq. ft.

Depositing Nickel on Rough Steel

If a smooth deposit is required over rough steel, instead of buffing down the steel, it is possible to pickle the steel in an acid until all the scale is removed and then depositing a heavy coat of copper, using an acid sulphate bath for this purpose. The heavy coat of copper is then buffed until it is smooth. The coat can now be finished in any way desirable. It is much cheaper to buff copper than steel.

Black Nickel Plating

Nickel Ammonium Sulphate	60 g. per l.
Zinc Sulphate	14 g. per l.
Sodium Sulphocyanate	14 g. per l.
pH = 5.8–6.0	

Gray Nickel Plating

Nickel Ammonium Sulphate	60 g. per l.
Sodium Sulphocyanate	14 g. per l.
pH = 5.4	

Plating Zinc with Nickel

(1) Strike for 5–10 minutes in any suitable cold nickel solution. The following formula is suggested:

Nickel Sulphate	15 oz. per gal.
Anhydrous Sodium Sulphate	15–18 oz. per gal.
Ammonium Chloride	2–3 oz. per gal.
Boric Acid	2 oz. per gal.

Temperature 78–85° F.
pH = 4.9–5.4 (electrometric)*
Current density 24–30 amp. per sq. ft.

(2) Rinse thoroughly in cold water.

(3) Transfer without drying to the following solution:

Nickel Sulphate	20 oz. per gal.
Ammonium Chloride	4 oz. per gal.
Boric Acid	2 oz. per gal.

Temperature 105–115° F.
pH = 5.0–5.3 (electrometric)
Current density 40–80 amp. per sq. ft.

* May be increased to as high as 30 ounces per gallon for intricate shapes.

Solvent Cleaning of Zinc

Grease and oil may be removed from zinc and zinc alloy castings by the use of trichloroethylene, carbon tetrachloride, xylol, ethyl acetate, etc. These solvents are most effective when used in apparatus involving vapor rinsing. However, these solvents do not remove oxide films and zinc salts and hence where parts are to be electroplated, the metal should subsequently be submitted to an

acid dip which serves the additional purpose of roughening the surface to provide good adhesion of the finish coating. The following solutions have been used in zinc alloy die castings:

(1) Phosphoric acid etch—treat for 30 seconds in 3% solution of phosphoric acid (85% H_3PO_4 grade, specific gravity 1.74) rinse and dry.

(2) Hydrochloric acid etch—treat for 30 seconds in a 10% solution of hydrochloric acid (35 to 37% HCl grade, specific gravity 1.18–1.19) rinse and dry.

(3) Hydrofluoric acid etch—treat for 30 seconds in a 1% solution of hydrofluoric acid solution (48% HF grade) rinse and dry.

Plating of Zinc

Considering nickel and nickel-chromium plated coatings on zinc and zinc alloy castings, a minimum thickness of coating of 0.0003 in. at the thinnest point is necessary to give any satisfaction in outdoor service. Completely satisfactory quality will not be obtained consistently with coatings of less than 0.001 in. average thickness.

Nickel Plating Solutions

Formula No. 1

Nickel Sulphate	10 oz. per gal.
Anhydrous Sodium Sulphate	10–15 oz. per gal.
Ammonium Chloride	2–3 oz. per gal.
Boric Acid	2 oz. per gal.

Operating details for this solution follow:

pH—This should be held between 5.3 and 5.7 electrometric or 5.8–6.2 colorimetric. The anode area should be controlled to minimize pH changes. pH should be checked daily and adjustments made by the addition of ammonium hydroxide or sulphuric acid as needed. Under best operating conditions this solution will tend slowly to become alkaline.

Temperature—For use in applying nickel directly on zinc this solution should be kept at or preferably slightly above room temperature (70–80° F.). If the temperature falls below 70° F. the deposits will be hard and brittle showing cracks. Temperature above 80° F. will tend to cause the formation of black streaks in recesses.

Nickel Content—The prescribed nickel sulphate content corresponds to about 2 oz. per gallon of nickel calculated as metal. No harm will result if this increases somewhat in use.

Sodium Sulphate Content—The amount of sodium sulphate present in the solution should be regulated to suit the complexity of the articles to be plated. Simple shapes may require not more than 10 oz. per gallon of sodium sulphate. More complicated shapes may require the presence of 15 oz. per gallon or more. Some commercial platers add as high as 30 oz. per gallon. In general, the sodium sulphate content should be the lowest possible for the articles being plated.

Current Density—When made up according to the formula given, the bath should be operated at between 12 and 20 amperes per sq. ft. The maximum current density will be determined by the tendency for the deposits to burn. In the presence of very high sodium sulphate concentrations, burning may develop at current densities lower than 20 amperes per sq. ft. If streaking occurs at the maximum current density, purifica tion of the solution may be necessary.

Agitation—Agitation reduces porosity and permits the use of somewhat higher current densities. With certain shapes, agitation will be found absolutely necessary for successful plating.

Pitting—Like all other nickel solutions this bath will at times develop a tendency towards pitting. This is usually an indication that foreign matter is present. A temporary cure can be effected by adding hydrogen peroxide or sodium perborate to the solution. Permanent freedom from pitting can only be obtained by continuous filtration and scrupulous care in avoiding the presence of foreign material in the solution. Pitting may on occasion develop from faulty cleaning.

No. 2

Nickel Sulphate	15 oz. per gal.
Anhydrous Sodium Sulphate	15 oz. per gal.
Ammonium Chloride	3 oz. per gal.
Boric Acid	2 oz. per gal.

Operating details for this solution are given below:

pH—Should be kept between 4.9 and 5.4 electrometric or 5.4–5.9 colorimetric by means of additions of *sodium hydroxide or hydrochloric acid.* Ammonium hydroxide and sulphuric acid should not be used as the solution is nearly saturated with respect to nickel ammonium sulphate.

Temperature—The more concentrated solution permits the use of somewhat higher current densities which in turn permit the use of higher temperatures of

operation which may be reflected in slightly softer deposits. The minimum safe temperature is 75° F. and the maximum is 87° F.

Nickel Content—Corresponds to about 3 oz. per gallon calculated as nickel metal. Any large increase in nickel content may result in crystallization of double nickel salts from solution.

Sodium Sulphate Content—Should be regulated as for the 2-oz. (nickel content) solution. In general, somewhat higher sodium sulphate contents will be required in the present case.

Current Density—This more concentrated solution permits the use of higher current densities, the range in the present case lying between 24 and 36 amperes per sq. ft.

Agitation-Pitting—The considerations mentioned under Formula No. 1 above hold in the present case.

No. 3

Nickel Sulphate	20 oz. per gal.
Ammonium Chloride	4 oz. per gal.
Boric Acid	2 oz. per gal.

Operating details for this solution are given below:

pH—The pH of this solution should be held between 5.0 and 5.3 electrometric or 5.5–5.8 colorimetric. Higher pH will cause cracking and peeling while lower pH will tend to increase the attack of the solution on exposed portions of the base.

Temperature—Should be between 105 and 115° F. (40–45° C.). Lower temperatures will not permit the deposition of soft nickel. Higher temperatures, while allowable, tend to cause excessive loss of water by evaporation.

Current Density—The current density should under no circumstances fall below 40 amperes per sq. ft. and preferably should be maintained at 60 amperes per sq. ft. or higher. Not only does the speed of production fall off at the lower current densities but contamination of the solution becomes more serious. These current densities are similar to those required for chromium plating and suitable generator capacity should be available.

Agitation—Agitation will tend to reduce pitting and porosity.

Pitting—Like most warm solutions, new baths of this composition may develop an exaggerated type of pitting. This condition can be readily overcome by additions of hydrogen peroxide. Sodium perborate should never be used for the reasons given below.

Sodium Salts—Sodium salts should not be permitted to enter this solution. When the solution is pure, very high current densities can be employed without burning. The presence of sodium salts very definitely restricts the operation to low current densities which not only do not utilize the full production capacity of the solution but also permit excessive zinc pickup. For these reasons the rinsing between nickel tanks should be thorough, sodium perborate should not be used to prevent pitting, and additions of alkali to raise pH should be made with ammonium hydroxide rather than sodium hydroxide.

Nickel Plating Methods

Three methods of applying adequate nickel coatings to zinc and zinc alloy castings have been found successful.

Multiple Nickel

This method consists essentially of depositing on the zinc articles, from either Formula No. 1 or No. 2 above, a coating of nickel 0.0001 in. to 0.0002 in. thick following which the articles are thoroughly rinsed in cold water and placed in a warm nickel solution (Formula No. 3) for completion of the plating to the required thickness.

The strike coating must be adequate to protect the zinc base from the action of the subsequently used warm solution. For simple shapes a 5-minute deposit at 25 amperes per sq. ft. may be sufficient. More complicated shapes will need 10 minutes at this current density.

Rinsing—In the interval between the two nickel tanks the articles should not be allowed to dry. If drying does occur poor adhesion of the second coat will develop. The use of cold water in the rinse will minimize the danger of this happening.

Copper-Nickel

While the system of plating nickel direct has a great many advantages, good results have also been obtained commercially by plating with copper-nickel deposits totalling 0.001 in. in thickness.

In this system of plating, the work is cleaned thoroughly, a coating of copper is applied to a thickness of 0.0005 in. from a copper-cyanide solution, followed, after rinsing, by the application of 0.0005 in. of nickel in a warm nickel solution (Formula No. 3).

The copper cyanide solution may be any one of those commonly used. A typical formula follows:

Sodium Cyanide	4–6 oz./gal.	(30–45 g. per l.)
Copper Cyanide	4 oz./gal.	(30 g. per l.)
Sodium Bicarbonate	1 oz./gal.	(7.5 g. per l.)
Sodium Bisulphate	¼ oz./gal.	(1.87 g. per l.)

The solution should be used at 70–113° F. (21–45° C.) with a current density of 10–15 amperes per sq. ft.

The copper-nickel system of plating is adapted to the production of heavy deposits. Its use is not advocated for coatings less than 0.0005 in. in thickness. The copper layer should be at least 0.0002 in. thick in order to avoid complete absorption by the zinc base and to provide protection of the zinc base from attack by the warm nickel solution. The copper layer fills the same role here as the primary or strike nickel deposit in the multiple nickel system of plating.

The nickel deposit must be at least 0.0003 in. thick for outdoor use. Thinner deposits will readily permit the seepage through pores of copper salts which will stain the surface with an unsightly brown film.

Nickel-Copper-Nickel

When coatings ranging from 0.00075 in. upward are desired, multiple coatings are necessary to avoid cracking. Multiple nickel coatings have been described above. The system nickel-copper-nickel has also been used successfully.

Clean the articles thoroughly as described under "Cleaning of Zinc and Zinc Alloys."

Plate 0.0002 in. of nickel in either cold solution described in Formulas No. 1 and No. 2.

Plate 0.0004 in. of copper from an acid-copper solution.

Color copper, coat, and clean.

Plate 0.0004 in. of nickel from any warm nickel solution such as described in Formula No. 3 above.

The buffing operation is not essential if the two primary coats are sufficiently smooth to make coloring of the final nickel readily accomplished.

The acid copper solution may be of any accepted composition. The following formula is typical:

Copper Sulphate	24 oz./gal.
Sulphuric Acid	6–8 oz./gal.

This solution is used at room temperature to 113° F. (45° C.) with a current density of 10–50 amperes per sq. ft. Animal glue may be used as a brightener in amounts of ⅛ oz. per gal. (0.9 g. per l.).

Bright Nickel Plating on Zinc

A bright nickel deposit which requires no buffing or coloring can be produced in the sulphate type of solution by the addition of 1/60 of an oz. per gal. of cadmium sulphate. A small amount of cadmium sulphate may be added from time to time to maintain the cadmium metal content in use.

The deposits produced are very bright and smooth but somewhat brittle and should not be deformed or bent. Chromium should not be deposited over such coatings as the additional stress will crack and peel the nickel.

Bright nickel deposits of this type tend to be brittle and are suitable only for use in thin form for indoor application.

Black Nickel Plating on Zinc

A bright, black, adherent coating can be obtained on zinc by a 2-minute plating in the following solution at 113° F. (45° C.).

Nickel Ammonium Sulphate	8 oz./gal.
Zinc Sulphate	1 oz./gal.
Sodium Sulphocyanate	2 oz./gal.
Current Density	1–2 amp./sq. ft.

Chromium Plating * on Zinc

Chromium may be applied either as a thin finish coating over nickel or as a heavy protective coating directly on zinc from the following solutions:

Chromium Oxide (CrO_3)	33 oz./gal.
Sulphuric Acid (H_2SO_4)	0.3 oz./gal.
or	
Chromium Oxide (CrO_3)	33 oz./gal.
Chromium Sulphate ($Cr_2(SO_4)_3$)	0.44 oz./gal.

For finish plating this should be used at 113° F. (45° C.) with lead anodes and at a current density of 75–150 amp. per sq. ft. A 3–6 minute deposit should be sufficient.

For heavy deposits applied directly on zinc these solutions may be used with the conditions of operations stated. The

* No consideration has been given to the patent situation involving chromium solutions which must be taken into account by the plater.

work should be plated for 20–25 minutes to insure reasonable thickness of coating. The deposits obtained will not be bright but will have a luster ranging from milky to frosty depending upon conditions. The explanation for the failure to obtain bright deposits apparently lies in the fact that these solutions etch the surface of the zinc slightly before deposition occurs to protect it. The deposits can, if only milky, be readily buffed to a bright luster.

Somewhat better protection and ease of buffing will be obtained with chromium deposits applied directly on the zinc from these solutions at room temperature with a current density of 50–125 amp. per sq. ft. The deposits will be dull gray in appearance but can be readily buffed or brushed to a high luster. The work should be plated for 20–25 minutes to insure a good protective plate.

Cadmium Plating * on Zinc

Recent practice to improve the surface appearance of zinc alloy die castings such as carburetors, etc., which do not require a fine finish is to cadmium plate them directly without buffing. Satisfactory deposits may be obtained from any of the numerous types of solution in use. A typical formula is:

Sodium Cyanide	7 oz./gal.
Cadmium Oxide	3 oz./gal.
Caustic Potash	2 oz./gal.

This solution should be used at room temperature to 133° F. (45° C.) with a current density of 10–25 amp. per sq. ft. Almost any of the patented brighteners will give satisfactory results.

* No consideration has been given here to the patent situation involving cadmium plating which must be taken into account by the plater.

Stripping Methods

Nickel-Chromium

Chromium and nickel may be removed by making the work anode in concentrated sulphuric acid to which a small quantity of commercial glycerin is added. Zinc is only slowly attacked by the concentrated acid but as the solution absorbs moisture from the air this attack will increase to the point where pitting of the zinc starts and the solution demands attention. The excess moisture may be removed by boiling the solution until heavy white fumes appear.

Nickel Coatings

Immerse in the following cold solution:

Water	1 part
Sulphuric Acid	2 parts
Nitric Acid	2 parts
Hydrochloric Acid	1/16 part

Prepare by adding the sulphuric and nitric acids to water and, after allowing the solution to cool, adding the hydrochloric acid.

Non-Electric Nickel Plating Compound

Formula No. 1

Nickel Ammonium Phosphate	5 oz.
Nickel Sulphate	3 oz.
Cream of Tartar	2 oz.
Tin Chloride	2 oz.
Ammonium Chloride	1 oz.
Codium Chloride	1 oz.
Copper Powder	2 oz.
Chalk Powder (Whiting or Precipitated Carbonate)	4–5 oz.
Water	until pasty

No. 2

Nickel Ammonium Sulphate	25 g.
Nickel Sulphate	15 g.
Cream of Tartar	10 g.
Tin Chloride	10 g.
Ammonium Chloride	5 g.
Salt	3 g.
Whiting	20 g.
Metallic Copper, Powder	10 g.
Water	until pasty

Rhenium Plating

Rhenium, with an atomic weight of 186.3, is a very heavy metal. It is both ductile and malleable, and has a brinell hardness of 250. It is quite soluble in nitric acid but insoluble in hydrochloric acid. Therefore it should find wide use for plating on jewelry, as the hydrochloric acid released in perspiration will not affect the deposit.

Bath 1

Potassium Perrhenate	11 g. per l.
Sulphuric Acid	9.3 g. per l.

Temperature, 25°–45° C. (77°–113° F.)
Current Density, 90–110 amp. per sq. ft.

Bath 2

Perrhenic Acid	20 g. per l.
Sulphuric Acid	5 g. per l.

Temperature, 25°–30° C. (77°–86° F.)
Current Density, 90–140 amp. per sq. ft.

Bath 3

Dissolve 8 g. of rhenium in concentrated nitric acid. Add 4 cc. of concen-

trated sulphuric acid, and boil until sulphur trioxide fumes are evolved. Dilute to one liter, and add enough sulphuric acid until 6 g. per l. is obtained. This solution may be used at 20°–60° C. with 50–100 amp. per sq. ft. using platinum as an insoluble anode, or rhenium as an anode. The metal deposits as a smooth shiny adhering deposit. The plating time can be 10–60 minutes.

Rhenium Nickel Plating

Potassium Perrhenate	11 g. per l.
Nickel Sulphate	6 g. per l.
Sulphuric Acid	9.3 g. per l.

Temperature, 25°–50° C.
Current Density, 50–60 amp. per sq. ft.

The alloy of nickel rhenium obtained from the above solution is somewhat lighter in color than pure rhenium.

Rhodium Plating

Five g. of rhodium chloride in 1 l. water are boiled with 40 g. of sodium nitrite until light yellow; 3 g. of sodium carbonate are added to remove traces of bismuth and the solution is filtered. After cooling 50 cc. of saturated aqueous ammonium chloride are added and precipitated ammonium rhodinitrite is collected and washed with cold water. 8.52 g. are heated to fuming with 33 cc. of concentrated sulphuric acid cooled, and diluted to 1 l. Deposition is best effected at 40° C. with platinum electrodes using a current density of 5 amp. per sq. ft. Cathode current efficiency is about 45%.

Rhodium Plating Silver
Canadian Patent 343,808

Five g. of rhodium ammonium nitrate is dissolved in 1 l. of boiling water containing 20 cc. of sulphuric acid, and after the reaction is completed 100 g. sodium nitrate and 20 g. ammonium nitrate are added. The mixture is evaporated to dryness and the residue dissolved in 1 l. of water to form an electrolyte for plating silver. Deposition is preferably conducted at 80–100° F. with a current of 20–50 amp. per sq. ft. of cathode surface and an inert anode, such as carbon or platinum. The plated silver resists tarnishing.

Non-Poisonous Silver Plating

Silver Nitrate	25–30 g.
Thiourea	60–70 g.
Water	1 l.

Use 0.2 amp. per sq. dm. at 30–35° C. at 1½ volts.

Silver Dip

Silver Chloride	1¼ oz./gal.
Sodium Cyanide	2½ oz./gal.

In order to apply this procedure to headlight reflectors it is necessary to remove any nickel plate, then polish and clean before dipping. The film of silver so produced is very thin and will have a short useful life.

Improving Silver Finish

There is no bright dip for silver in the same way as a dip for brass or copper. The surface of the parts in question can be improved by making them anodes in a solution containing 8 oz./gal. of sodium cyanide and 8 oz./gal. of sodium ferrocyanide. Use 10–15 amp./sq. ft. and about 6 volts pressure. Keep work well agitated.

Non-Poisonous Silver Plating

Citric Acid	60 g.
Sodium Iodide	520 g.

Use a silver anode with current density of 1–1.8 amp. per sq. dm.

Silver Plating Stainless Steel

In silver plating stainless steel it is essential to etch slightly the surface with an acid pickle. This is done to obtain a metallic surface that the subsequent electro-deposit of silver will adhere to.

A pickle made up of 10%–15% sulphuric acid, either electrolytic or still, at a temperature of 150°–160° F., will work satisfactorily.

A silver plating bath of the following composition can be used:

Silver Cyanide	4 troy oz./gal.
Sodium Cyanide	5 oz./gal.
Free Cyanide	4 oz./gal.
Water	1 gal.

Non-Electric Silver Plating Compound

Silver Nitrate	6 oz.
Ammonium Chloride	6 oz.
Sodium Thiosulphate	10 oz.
Calcium Carbonate or Chalk	10 oz.
Water	until pasty

Brightener for Silver Solution

Silver Solution	1 qt.
Sodium Cyanide	8 oz.
Carbon Bisulphide	1 oz.
Ether	1 oz.

To prepare the brightener place the carbon bisulphide and ether in a quart

bottle and shake thoroughly. Dissolve the cyanide in the silver solution and fill bottle. Shake bottle from time to time until the carbon bisulphide is thoroughly dissolved and then filter. One ounce of this stock solution should be sufficient for an addition to each 50 gal. of the regular plating solution. Care must be taken to avoid an excess.

Silver Strips

Formula No. 1

Sodium Cyanide	12 oz.
Caustic Soda	2 oz.
Water	1 gal.

Reverse current with cold rolled steel as cathodes. Voltage 6 to 8. Agitate the work for a cleaner job.

No. 2

Sulphuric Acid	5 gal.
Nitric Acid	1 gal.

Place crock that contains the strip in a hot water container. If all water is kept from the strip, brass or copper work will be attacked only slightly.

Removing Fire Scale from Silver

Nitric Acid	2 oz.
Water	1 oz.

Use hot and agitate work.

Removing Fire Scale by Reverse Current

Sodium Cyanide	8 oz.
Water	1 gal.

Use hot and agitate work. Lead anodes; 4–6 volts.

Bright Dip

Sulphuric Acid	2 gal.
Nitric Acid	1 gal.
Water	1 qt.

Add 1 oz. of muriatic acid for 5 gal. of above.

It is necessary to add water only when a new bright dip is made. Dip must be operated cold.

Matt Dip

Sulphuric Acid	1 gal.
Nitric Acid	1 gal.
Zinc Oxide	2 lb.

Operate hot and keep out all water and chlorides. If the matt is coarse, add sulphuric; if too fine nitric acid.

Gold Solutions

Cyanide Solution

Metallic Gold as fulminate or Cyanide	5 dwt.
Sodium Cyanide	2 oz.
Sodium Phosphate	1 oz.
Water	1 gal.

Temperature 130–160° F.; 1 volt; 24 kt. gold anodes.

Chloride Solution

Gold Chloride	6 oz.
Hydrochloric Acid	10 oz.
Water	1 gal.

Room Temperature; 2–3 volts.

In preparing the solution dissolve the gold chloride in dilute hydrochloric acid before adding it to the solution.

Silver Solution

Formula No. 1

Silver Cyanide	3½ oz.
Sodium Cyanide	5 oz.
Sodium Carbonate	2 oz.
Water	1 gal.

No. 2

Silver Cyanide	3½ oz.
Sodium Cyanide	8 oz.
Sodium Carbonate	2 oz.
Water	1 gal.

Either of the two solutions will give good results if operated at a temperature of 75° F. with a cathode current density of 4 or 5 amp. per sq. ft.; ¾ to 1 volt. Formula No. 1 is generally used, but the deposit of No. 2 is whiter.

Silver Strike

Silver Cyanide	½ oz.
Sodium Cyanide	8 oz.
Water	1 gal.

Use steel or carbon anodes; 6 volts.

Black or Gun Metal Finish on Steel

A black or gun metal finish may be obtained on steel articles by heating them in a retort with a small amount of charred bone and heated to 700°–800° F. After articles are thoroughly oxidized temperature is dropped to 650° F. and a mixture of bone and bone oil is added. Several hours are required to produce finish. Articles after coming from retort are rolled in oily granulated cork until uniform black finish is secured.

The following solution will give to aluminum a uniform black color:

Water	1 l.
Potassium Permanganate	5–10 g.

Nitric Acid 28° Bé.	2– 4 cc.
Copper Nitrate	20–25 g.

Temperature, 80° C.

Time to obtain deep black, 20–30 minutes.

Tantulum Plating
U. S. Patent 1,933,319

The electrolyte is a fused mixture of

Potassium Chloride	300 g.
Potassium Fluoride	120 g.
Potassium Tantulum Fluoride	100 g.
Tantulum Oxide	25 g.

in a graphite crucible at 750° C. This bath gives a bright plate on iron or nickel at 1 to 10 amp. per sq. dm.

Tin-Plating from An Alkaline Bath

Tin-plating of copper, brass, zinc, lead, hard lead, iron, steel and aluminum can best be carried out at 0.15–0.5 volt in alkaline aqueous stannous chloride, or in alkaline aqueous sodium stannate plus sodium chloride, with 0.12–0.2 g. of gelatin per l. A tin anode (anode current density 0.45–1.6 amp. per sq. dm.) can be used. A cathode current density is 0.2–1.5 amp. per sq. dm. The maximum and minimum concentrations of the bath are 50 g. of tin salt for 2 molecules of sodium hydroxide and 12 g. for 1 molecule respectively.

Non-Poisonous Tin Bath

An alkaline tin bath without cyanides to be used at 50–60° C. is composed of sodium stannate 7.5 kg., sodium acetate 1.25 kg., sodium hydroxide 1.25 kg., starch 70 g., water 100 l. Anodes are partly of tin, partly of iron. The bath can be used for electrical tinning of kitchen utensils.

Tin Solution

Sodium Stannate	12 oz.
Caustic Soda	1 oz.
Sodium Acetate	2 oz.
Hydrogen Peroxide (25 Volume) or	1/12 oz.
Sodium Perborate	1/8 oz.
Water	1 gal.

The solution is operated at a temperature of 140–160° F.; 4 to 6 volts; anode current density, 20–60 amp. per sq. ft.

Immersion Tin Solution

Tin Chloride	½ oz.
Aluminum Sulphate	2 oz.
Cream Tartar	2 oz.
Water	1 gal.

The solution is allowed to boil for 30 to 45 minutes and the addition of a very small quantity of sulphuric acid (about 1 drop to each gal. of solution) hastens the deposition of the tin deposit.

Caustic Soda Method (Tin)

This method is used to tin by immersion, small brass or copper articles.

Caustic Soda	12 oz.
Stannous Chloride	4 oz.
Sodium Chloride	1 oz.
Water	1 gal.

The solution is placed in an iron tank, which is heated with a steam coil. The bottom of the tank is covered with moss tin over which is placed an iron wire screen. The work to be tinned is bright dipped or tumbled clean, placed in brass wire baskets and separated with sheets of perforated tin, placed in solution at boiling temperature for 15 to 30 minutes, or until covered with tin. Rinse thoroughly in clean cold water, hot water, dry in sawdust.

Protecting Tin and Lead Against Corrosion
French Patent 777,314

Dip in following solution:

Copper Sulphate	25 g.
Nickel Sulphate	15 g.
Ammonium Molybdate	3 g.
Water	1 l.

Tungsten Plating

The Carbonate Bath:

Tungstic Acid	125 g. per l.
Sodium Carbonate	330 g. per l.

Use at 90° C., 50 amp. per sq. ft.

The Phosphate Bath:

Tungstic Acid	100 g. per l.
Sodium Phosphate ($Na_3PO_4 \cdot 12H_2O$)	500 g. per l.

Use at 90° C. with 50 amp. per sq. ft.

Citric Acid Bath:

Tungstic Acid	100 g. per l.
Potassium Hydroxide	70 g. per l.
Citric Acid (2.5 Molar Citric Acid)	250 cc. per l.

Use platinum anodes; 50 amp. per sq. ft. at 20° C.

Electrolytic Surface Treatment of Zinc
British Patent 421,696

Zinc and alloys consisting mainly thereof are provided with an insoluble

coating resistant to weathering and corrosion by anodic treatment in a substantially neutral electrolyte containing an alkali metal ferrocyanide, ferricyanide, dichromate, oxalate or molybdate or ammonium oxalate or molybdate or more than 1 of these. Suitable baths contain 35 g. crystal ammonium oxalate or 50 g. crystal potassium ferrocyanide per l. The metal surface may first be cleaned by cathodic treatment in a bath containing 45 g. sodium phosphate, tribasic, per l. The coatings may be painted, lacquered or dyed, color coatings being obtainable by adding a dye to the electrolyte.

Zinc Solutions

Acid Zinc Solution

Zinc Sulphate	32 oz.
Ammonium Chloride	2 oz.
Sodium Acetate	2 oz.
Water	1 gal.

Temperature 80° F. Cathode current density, 15–20 amp. per sq. ft.; 3–4 volts; pH, 3.5–4.5, using thymol blue as an indicator.

Cyanide Zinc Solution

Zinc Cyanide	4 oz.
Sodium Cyanide	4 oz.
Caustic Soda	3 oz.
Water	1 gal.

Temperature 100° F. Cathode current density 10–15 amp. per sq. ft.; 2–3 volts; keep free cyanide equal to metal content. Use pure zinc anodes. Finish work by rinsing in cold water, then hot water, then drying in hardwood sawdust.

Zinc Cadmium Alloy Plating

Zinc Sulphate	295 g. per l.
Cadmium Sulphate	50 g. per l.
Aluminum Sulphate	30 g. per l.
Caffeine or Licorice	5 mg. per l.

Sulphuric acid may be used in small amounts, but as a general rule, the deposit will not be as bright if acid is present, although appreciably harder. This alloy coating can be deposited directly upon iron, steel, brass, bronze, copper, etc.

Coloring Zinc Dark Brown

U. S. Patent 1,853,323

Zinc or die cast zinc can be colored dark brown by treating in a bath containing:

Chromic Acid	200 g. per l.
Sulphuric Acid	2 g. per l.

provided the material is treated with an alternating current.

Cleaner for Barrel Plating

Water	1 gal.
Soda Ash	6 oz.
Caustic Soda	2 oz.

This is not suitable for work which has soldered or tinned parts. Such parts should be cleaned in a cleaner which does not readily attack solder or tin. This should be used, 8 oz. to each gal. of water. More may be used without any bad effect upon such work immersed not more than 20 minutes, which will ordinarily clean almost any "hard to clean" parts. It is understood of course that the solution should be kept hot, 180° F.

This cleaner does not readily tarnish brass and copper and has a considerable amount of insoluble material in it which has a scrubbing effect when boiling. This is very effective also in removing oils and dirt and does not require frequent replenishing.

This cleaner is sold on the market under various trade names, the only difference being in the proportions of the 3 sodium compounds.

Another effective cleaning solution used hot or boiling is composed as follows:

Water	1 gal.
Soda Ash	4 oz.
Caustic Soda	2 oz.
Trisodium Phosphate	2 oz.

This too may be varied to suit almost any requirement in cleaning, but a solution made up weaker than the above formula will not work well long. The formula approximates very closely many proprietary cleaners now on the market.

One of the best and simplest combinations for an electrical cleaner is as follows:

Water	1 gal.
Soda Ash	2 oz.
Caustic Soda	1 oz.
Trisodium Phosphate	1 oz.

This may be modified to meet almost any problem of cleaning with the current.

Cleaning Enamel from Metals

Using 50 amp. per sq. ft. at 2½ volts, reversing polarity at 10-second intervals and using following bath gives excellent results.

Caustic Soda	13.6 oz.

Trisodium Phosphate	6.38	oz.
Sodium Silicate	1.62	oz.
Water	to make 1	gal.

Cleaning Phosphor Bronze Sheets

After the regular sulphuric acid pickling, they are treated in a bath made of a 10% solution of sulphuric acid with ¼ to ½ lb. of sodium bichromate added to each gal. of the solution.

The general practice is to heat the solution with live steam.

Metal Cleaner for Electroplating

Sodium Metasilicate	2	lb.
Trisodium Phosphate	2	lb.
Soda Ash	2	lb.
Rosin Soap	0.18	lb.

The quantities given are for each gal. of water in the cleaning tank. Have the water near the boiling point and add the materials by dusting on the surface and stirring until dissolved.

Electroplating Radiators
British Patent 425,846

Copper cynanide 40, sodium stannate 20, total sodium cyanide 65, sodium hydroxide, 7.5 g. per l. is specified, this having a free sodium cyanide content of 20 g. per l. and pH 13. A current density of 1–80 amp. per sq. ft., or higher, and a bath temperature 15–17° C. are used. A deposit containing 13–16% tin is obtained. A suitable alloy for automobile radiator shells is tin 15% and copper 85%. The anode preferably consists of an alloy in the proportions of the desired deposit but these may vary by 10% or more. The anodes should be heat-treated to obtain a maximum softness by casting in a metal mold, cooling in the mold, heating to 1000° F. for 15 minutes and quenching in water. The alkalinity of the bath should be maintained at a pH 12.8–13.5 and the free sodium cyanide at 10–45 g. per l.

Coloring Razor Blades Blue

After blades have been hardened and drawn and being sure that surfaces are absolutely clean, polish well and heat to 550–600° F. This temperature will not affect temper.

Protection of Magnesium by Means of Selenium Coatings

Of many methods tried for coating magnesium with selenium, the following give the same results: (1) immersion for 3 hours in an aqueous solution of 8% sodium selenite, 3.2% selenious acid and 0.10% sodium chloride at 80–90° C.; (2) a 10% selenious acid solution with 0.1–0.5% sodium chloride for 5–10 minutes; (3) a 2% sodium selenite solution with 0.2% phosphoric acid for 1 minute; (4) initial cleaning for 30 seconds in 1% chromic acid at 80° and then treatment as in method 3; (5) cleaning as in method 4 followed by method 2.

Increasing Life of Graphite Electrodes

To increase their resistance to attack during electrolysis anodes 25 × 25 mm. in size are soaked in coal tar for 1½–2 hours at 150–180° F., or in pitch for 3–5 hours at 300–350°. They are then heated at 300–500° to drive out the more volatile compounds. Larger anodes require longer treatment. Such anodes are more stable and more efficient than anodes treated with linseed oil. Mixtures of tar and pitch, or bakelite lacquers, may also be used.

Aluminum Polish

Formula No. 1

Potassium Hydroxide	40 g.
Water	900 cc.
Olive Elaine	150 cc.
Alcohol	25 cc.
Ethylene Dichloride	50 cc.

Add the potassium hydroxide to the water, warm to 75° C. and slowly stir in the olive Elaine until completely dissolved. Cool and add the alcohol and ethylene dichloride.

Directions for Use

Dip a piece of fine steel wool or rough cloth into a liquid and rub on to the aluminum. Then wash the surface with hot water and dry as usual. This aluminum polish used in dish water in proportions of about 2 tbsp. per 1 gal. will soften the water and assist in cleaning.

No. 2

Whiting	75 g.
Tripoli, Fine, Yellow	20 g.
Sodium Bicarbonate	3 g.
Potassium Sulphocyanide	2 g.

Add Glycerin Water (25%) until pasty.

Silver Plating Polish

(Renews as it polishes)

Silver Nitrate	30 oz.
Salt	30 oz.
Cream of Tartar	200 oz.

Grind and sift through 100 mesh sieve. Then make into a paste with

"Cellosolve"	50 parts
Water	50 parts

Silver Polish

Soap	20 oz.
Stearic Acid	5 oz.
Gilders Whiting	32 oz.
Tripoli	3 oz.
Sodium Thiosulphate	3 oz.
Water	37 oz.

Silver Polishing Cloth

a.	Hard Soap	10 oz.
	Water	45 oz.
b.	Olein, Distilled	6 oz.
c.	Calcium Carbonate, Precipitated	20 oz.
	Iron Oxide—Red	5 oz.
d.	Ammonia (10%)	4 oz.
e.	Alcohol	10 oz.

Dissolve *a* in an enameled or zinc-plated or tin-plated steam-heated kettle; when at 60–70° C., add *b*, stirring to form homogeneous emulsion, then add the powders *c*. Saponify with *d*, let stand several hours, and add *e*. Then impregnate rags in this solution.

Non-Scouring Copper Polish

Make a paste of finely powdered glass and mineral oil. This will not scratch.

Polish for Chromium, Liquid

a.	Hard Soap, Powder	3 g.
b.	Water, Hot	53 cc.
c.	Olein, Distilled	5 cc.
d.	Ammonia (10%)	3 cc.
e.	Alcohol, Denatured	16 cc.
f.	Tripoli	20 g.

Dissolve *a* and *b*, saponify with *c*, dilute with *e*, add *f*.

Chromium Polishes

Formula No. 1

Olein	20 cc.
Stearin	60 g.
Melt.	
Calcium Carbonate (Powdered)	20–30 g.
Cool, powder.	

No. 2

Chromium Oxide	60 g.
Stearic Acid or Paraffin Wax	40 g.

No. 3

Carnauba Wax	10 g.
Yellow Wax	15 g.
Japan Wax	15 g.
Paraffin Wax (46–48° C.)	60 g.

Melt on water bath.

Melt together and add:

Turpentine	130 cc.
Tripoli, Dry	70 g.
Turpentine	100 cc.

No. 4

Rouge (Iron Oxide)	50 g.
Kieselguhr, White, Burned	100 g.
Neuburger Chalk	150 g.
Coconut Oil Soap	700 g.

No. 5

Chromium Oxide, Powdered	50 g.
Paraffin Wax	50 g.
Emery	30–50 g.

No. 6

Stearin	90 g.
Stearin Oil	25–30 cc.
Neuburger Chalk	30–45 g.

Melt together.

Cool; powder.

Polish for Metals

French Patent 772,648

Formula No. 1

A polishing compound contains kaolin 30–50, talc 10–20, rosin 18–30, alcohol 4–15, ammonia 5–18 and acetone 1–10 parts by weight.

No. 2

French Patent 772,691

A compound contains powdered silicon dioxide 35, soap powder 5.9, neutral oil 0.23, ammonium sulphate 3.1 and bentonite 0.63 kilograms.

No. 3

Kieselguhr	2 parts
Strong Ammonia Water	1 part
Denatured Alcohol	1 part

Shake well with water q.s. to give creamy consistency.

Metal Polish (Sidol Type)

a.	Olein, Distilled	4.5 cc.
	Stearin	1 g.
	Alcohol	5 cc.

Heat to 50° C.

b.	Ammonia (sp. gr. 0.91)	7 cc.

Saponify.

c.	Oxalic Acid	2 g.
	Water (50–60° C.)	70 cc.
d.	Neuburger Chalk	25 g.

Optional:—add more water.

Metal Polish Block

a.	Stearin	25 g.
	Olein	5 cc.
b.	Spindle Oil, Refined	2–10 cc.
	Vienna Lime	30 g.
c.	English Red (Ferrous Oxide)	38–30 g.

Mix first *b*, to prevent saponification of the fats *a*.

Black Polish for Ovens

Formula No. 1

Graphite, Flaky	1000 lb.
Lampblack	50 lb.
Beeswax, Crude	10 lb.
Montan Wax, Crude	100 lb.
Paraffin Scales (50–52° C.)	30 lb.

Melt together.

Nigrosine, Fat Soluble	5 lb.
Naphtha	until pasty

No. 2

Graphite, Colloidal	20 lb.
Paraffin Wax	13 lb.
Lacquer Benzoline (White Spirits)	67 lb.

No. 3

a.	Olein, Distillate	15 cc.
	Stearin (52–54° C. titer)	5 g.
b.	Ammonia (25%)	4 cc.
c.	Spindle Oil	10 cc.
	Alcohol	40–50 cc.

Melt *a* on water bath, saponify with *b*, add *c*, then an abrasive (Emery, Carborundum, Chromium Green, Graphite).

Automobile Polish Cleaner

Formula No. 1

a.	Olein	10 cc.
	Mineral Oil	20 cc.
	Petroleum	20 cc.
	Turpentine Oil or White Spirit	28 cc.
b.	Alcohol	6 cc.
	Ammonia (0.910)	6 cc.
c.	Infusorial Earth	10 g.

No. 2

Yellow Wax	10 oz.
*Air-Floated Tripoli	18 oz.
White Spirit	19 oz.
Soft Soap	½ oz.
Water	2½ oz.

Melt the wax in a double pan and add the powder slowly; keep stirring while slowly adding the white spirit. Dissolve the soft soap in the water and add to the mix with constant stirring. On cooling this forms a soft paste.

A liquid polish can be made as follows:

No. 3

White Spirit	2½ pt.
Mineral Oil	2½ pt.
Turkey Red Oil	4 pt.
Ammonia	1 oz.
Water	5 pt.
Glycerin	1 pt.
Formaldehyde	8 oz.

*Fuller's Earth	8	oz.
*Bentonite	6	oz.

Mix the oils together first and add the abrasive powders, then the water, ammonia, glycerin, and formaldehyde; stir rapidly until a smooth mixture is obtained.

* The quantity and type of abrasive used can be varied according to whether the polish is to have a strong or mild abrasive action. Polishes to be used as maintenance polishes by car owners should be only mildly abrasive, otherwise too much of the finish will be rubbed off.

Car Polishes
Formula No. 1

a. Spindle Oil, Refined	80–85	g.
a. Methyl Hexalin	20–15	g.
b. Distilled, Warmed Water	400–900	g.

Add *b* to the mixture *a* with high speed stirring.

Apply spraying and polish with a rag.

No. 2

Linseed Oil	200	g.
Dipentene	300	g.
Paraffin Oil	200	g.
Petroleum, Refined	250	g.
Camphor Oil, Light	50	g.

Apply simply with rag.

Automobile Cleaner and Polish

Kieselguhr	30	oz.
Tripoli	5	oz.
Paraffin Wax	4.5	oz.
Carnauba Wax	0.5	oz.
Varnolene	30	oz.

Tint with iron oxide.

Automobile Paste Polish

Carnauba Wax	5	oz.
Beeswax	5	oz.
Ceresin Wax	5	oz.
Stearic Acid	2	oz.
Soap	2	oz.
Varnolene	45	oz.
Water	10	oz.

Automobile Polish, Powdered

Mineral Oil	5	lb.
Kerosene	10	lb.
Diglycol Laurate	1	lb.
Silica Dust	½	lb.
Kieselguhr	4	lb.
Tripoli	1	lb.

Automobile Polish (Tumbler's)
U. S. Patent 1,969,387

To 3½ gal. of pale blown castor oil, add ¾ gal. of orthodichlorbenzol. This is mixture No. 1. To 15 gal. of water, add 11 gal. of neutral pale mineral oil and ¾ gal. of ammonia, which has been previously made up of one part of ammonia of 26° Bé. and 4 parts of water. This is mixture No. 2. Mixture No. 1 and mixture No. 2 are combined and agitated for about 5 minutes. Three and one-half gallons of special petroleum spirit is added and the whole mass is now stirred about 10 minutes. It is then run through a colloid mill and is ready for use. Alternatively, all of the ingredients may be mixed in a single batch and passed through the colloid mill, which breaks up the particles to a fine degree. This obviates preparing separate mixtures.

Auto Polish
U. S. Patent 1,979,787

Wax Base

Carnauba Wax	66.5	g.
Petrolatum Wax (160 to 165° F. Melting Point)	26.6	g.
Petrolatum (140° F. Melting Point)	6.3	g.
Rosin	0.6	g.
Wax Base (Prepared as Above Described)	9	g.
Refined Mineral Oil (Narrow Cut)	41	g.
Starch	0.5	g.
Water	49.5	g.

The refined oil is a distillate having an initial boiling point of about 350° F. and an end point of about 475° F. Although it is not necessary that these precise limits be maintained, it is important that a narrow cut be used of about this range. The so-called "W.W. 150" (water white kerosene), with a boiling range of about 373 to 504° F. evaporates too slowly, while oleum spirits, with a boiling range of about 300 to 425° F. evaporates too rapidly to give best results. The narrow boiling range of the refined oil is of particular importance in a "set" or solid emulsion of this type. It is also of particular importance that the oil be highly refined (treated with sulphuric acid for the removal of unsaturateds and other impurities) because untreated light petroleum distillates may be injurious to the skin.

In preparing the finished product melt

the base stock with the refined oil and heat the mixture to a temperature of about 175 to 200° F. Then boil a 1% starch solution and make an oil-in-water emulsion in a colloid mill at a temperature above the melting point of the wax and below the boiling point of the water, usually at about 130 to 200° F. When the resulting emulsion cools, it sets to form a semi-hard, solidified emulsion which is extremely stable and which possesses entirely different structural properties from the ordinary liquid oil-in-water emulsions of the same concentrations. The product may be stored for an indefinite period of time without separation, and it may be easily handled and applied.

Solid Abrasive Polish (Wax), Automobile

Formula No. 1

a.	Montan Wax, Bleached	8 g.
	Paraffin (40–42° C.)	8 g.
	Ozokerite, Refined	2 g.
b.	Infusorial Earth	35 g.
	Spindle Oil, Refined	13 cc.
	White Spirit	13 cc.
c.	Turpentine Oil or Substitute	21 cc.

No. 2

a.	Montan Wax, Bleached	8 g.
	Montan Wax, Double Bleached	5 g.
	Olein	2 cc.
b.	Potassium Carbonate	2 g.
	Glycerin (28° Bé.)	3 cc.
	Water, Boiling	40 cc.
c.	Yellow Clay or Bentonite	to suit
d.	Turpentine Oil or White Spirit	22 cc.

Melt *a*, add hot (boiling) *b*, then *c*; cool, add *d*.

Auto Polish

Formula No. 1

Montan Wax, Bleached	4 g.
Paraffin Wax (50–52° C.)	5 g.
Hard Soap	1 g.
Water	67 cc.
Water Soluble Dyestuff (Black: 4 parts Nigrosine)	2 g.
Ammonium Hydroxide (0.910)	1 cc.
Alcohol	20 cc.

No. 2

Montan Wax, Bleached	7 g.
Soft Soap	3 g.
Potassium Carbonate	0.8 g.
Water	87.2 cc.
Water Soluble Dyestuff (Black: 4 parts Nigrosine)	2 g.

No. 3

Shellac (Orange)	14 g.
Alcohol	60 cc.
Carnauba Wax	2 g.
Paraffin Wax (50–52° C.)	1 g.
Turpentine	23 g.

Polish for Lacquered or Polished Objects

Swiss Patent 172,736

Turpentine	100 cc.
Paraffin	50 g.
Beeswax	15 g.
Silica Powder	2 g.
Chalk Meal	1.5 g.
Vienna Lime	2 g.
Oxalic Acid	1 g.
Ammonia (28%)	10 cc.

Polish for Leather Furniture

Paraffin Wax (50–52° C.)	20 g.
Ozokerite/Ceresin (58–60° C.)	5 g.
Wool Fat, Neutral	5 g.
Beeswax	10 g.
Carnauba Wax	10 g.
Turpentine Oil	150 g.

Color similar to that of furniture. Pour at 40–45° C. into jar.

Furniture Polish

Formula No. 1

Raw Linseed Oil	10 oz.
Spindle Oil	50 oz.
Stoddard Solvent	15 oz.
Xylol	5 oz.
Soft Soap	1 oz.
Water	19 oz.

No. 2

Paraffin Oil	20 oz.
Red Oil	5 oz.
Soft Soap	3 oz.
Gum Arabic	2 oz.
Water	70 oz.

The above are mixed vigorously until completely emulsified.

No. 3

Carnauba Wax	2 g.
Montan Wax, Bleached	6 g.
Beeswax	5 g.
Paraffin Wax (52–54° C.)	14 g.

Melt.

Add:

Linseed Oil (or Varnish)	3 g.

And (when temperature is 43–45° C.) add:

Turpentine	70 g.

Liquid Furniture Polish

a.	Beeswax, Yellow	13 g.
	Ozokerite, Yellow	2 g.
b.	Thinner (White Spirit)	75 cc.
c.	Alkali Solution (Water: Ammonia (0.91) = 85:15)	10 cc.

Melt up *a*, add the warmed *b* to clear solution, then add *c* in thin jet, stirring thoroughly.

Furniture Polish

Formula No. 1

a.	Paraffin Oil, Yellow	100 cc.
	Naphtha, Refined	50 cc.
	Tetralin, Dipentene	50 cc.
	Precipitated Chalk	25 g.
b.	Lactic Acid (50%)	50 cc.
	Water	225 cc.

Add *b* to *a* in thin, continuous jet; stir well.

No. 2

Boiled Linseed Oil	10 lb.
Raw Linseed Oil	12 lb.
Denatured Alcohol	2 lb.
Vinegar	12 lb.
Turpentine	14 lb.
Petroleum Spirits	27 lb.

or

Raw Linseed Oil	2 gal.
Paint Drier	½ gal.
Vinegar	6 gal.

Furniture Finishers Polish

Turpentine	7 lb.
Mineral Oil	7 lb.
Cedarwood Oil	2 oz.
Sassafras Oil	1 oz.
Rottenstone, Fine Powdered	4 oz.

Covering Polish for High-Gloss Polished Furniture

Collodion Wool (Nitrocellulose), Alcohol Soluble, soaked in Butanol (2:1)	12 g.
Ethylene Glycol	6 g.
Toluene	12 g.
Tricresyl Phosphate	2 g.
Shellac (Free from Wax)	10 g.
Alcohol (95–96%) or Butanol	58 g.
Thinner (Alcohol)	optional

Floor Polish

Formula No. 1

a.	Carnauba Wax	15 g.
	Montan Wax	5 g.
	Rosin, Pale	5 g.

Melt on water bath, put out fire. Add:

b.	Turpentine Oil, or Substitute	20 cc.

At same time prepare:

c.	Potassium Carbonate	5 g.
	Hard Soap	5 g.
	Water, Hot	45 cc.

and pour in thin jet into *a* plus *b*, stir. Keep temperature at 55–60° C. Stir continuously, add a yellow dye, then pour into cans.

No. 2

Paraffin Scale	12 g.
Shellac Wax	5 g.
Carnauba Wax	4 g.
Ozokerite Ceresin (58–60° C.)	3 g.
Montan Wax, Bleached	4 g.
Turpentine Oil Substitute	72 cc.

No. 3 (White)

Carnauba Wax, Bleached	6 g.
Ozokerite, Refined	4 g.
Paraffin (50–52° C.)	20 g.
Thinner (Turpentine Oils, Dipentene, Hydroterpene, Decaline, White Spirit)	70 g.

No. 4 (White)

Montan Wax, Double Bleached	12 g.
Montan Wax, Bleached	5 g.
Paraffin (50–52° C.)	6 g.
Ozokerite, Refined	2 g.
Thinner	75 g.

No. 5 (White)

Montan Wax, Double Bleached	8 g.
Montan Wax, Bleached	3 g.
Paraffin (50–52° C.)	19 g.
Thinner	70 g.

No. 6 (Yellow or Orange)

Carnauba Wax, Fat-Gray*	4 g.
Ozokerite, Yellow	2 g.
Paraffin (48–50° C.), Yellow	24 g.
Thinner	70 g.

* Dye with 0.02% Sudan Yellow G.

Liquid Floor Polish

Melt:

Paraffin Wax (50–52° C.)	50 g.
Ceresin (58–60° C.)	10 g.
Carnauba Wax	40 g.

and dissolve:

In summer, 7–9 parts in 93–91 parts of turpentine.

In winter, 6–7 parts in 94–93 parts of turpentine.

Deodorized Floor Polish

Paraffin Wax (50–52° C.)	18 g.
Carnauba Wax	5 g.
Ceresin (58–60° C.)	2 g.
Rosin, Pale	4 g.

Stearin	1	g.
Potassium Carbonate	2	g.
Caustic Soda (38° Bé.)	0.5	cc.
Water	66	cc.

Boil and stir until smooth.

Dyestuffs for Floor Polishes

Yellow:
Sudan Yellow RRN

Orange:
Sudan Orange G, RR

Red:
Sudan Red 5B

Brown:
Sudan Brown B, 3B, RRN

Reddish Brown:

Sudan Brown 3B	66%
Sudan Red 5B	34%

Chocolate Brown:

Sudan Brown 3B	60%
Sudan Red 5B	30%
Sudan Black BT	10%

Other Oil Coloring Bases

Yellow:
Leather Yellow—Fat Dye

Orange:

Leather Yellow—Fat Dye	66%
Red Fat Dye	34%

Red:
Red Fat Dye

Brown:
Brown Fat Dye

Reddish Brown:

Brown Fat Dye	66%
Red Fat Dye	34%

Chocolate Brown:

Brown Fat Dye	60%
Red Fat Dye	30%
Ceres Black I, pieces	10%

Pigments:
Red: Iron Oxide Red
Brown: Iron Oxide Brown

Floor Oils

Spindle Oil, Pale, Viscosity 2.5–5E (20° C.), Ignition Point 160–200° C.	95 cc.
Olein	5 cc.

Mop (Floor) Oils

Formula No. 1

Spindle Oil, Refined, sp. g. = 0.850; 1.8–2.5E (20° C.)	70 cc.
Benzine	25 cc.
Balm-Turpentine Oil, Hydroterpene, Wood-Turpentine Oil or Refined Pine Oil	5 cc.

No. 2

Spindle Oil, Refined (see above)	60 cc.
Petroleum	27 cc.
Camphor Oil	3 cc.

No. 3

Spindle Oil, Refined (see above)	50 cc.
Benzine	40 cc.
Turpentine	5 cc.
Citronella Oil	5 cc.

Mop Oil Polishes

Above given formulae, but adding

Waxes (as Montan Wax, Bleached, or Paraffin Scale Wax)	2–3 g.

Dye with

Sudan Dyes	0.02 g.
or	
Basic Dyes	0.06 g.

Water "Soluble" Floor Oil

Spindle Oil, 5E (20° C.)	40 cc.
Tallöl, Crude	20 cc.

Mix, warm to 70° C., add in thin jet:

Caustic Soda, 38° Bé.	8 cc.

Boil to saponify, add again

Spindle Oil (as above)	27 cc.

Boil shortly, add boiling

Water (to thin the alkali)	5 cc.

Use: 1 part oil in 6–10 parts water.

Yellow Floor Wax

Formula	No. 1	No. 2	No. 3	
Paraffin Wax	16000	16000	16000	g.
Carnauba Wax	3000	3000	2500	g.
Beeswax, Yellow	1000	2000	1500	g.
Turpentine	46000	25000	30000	cc.
"Yellow 1435" (Dye)	20	20	20	g.
Amyl Acetate	—	—	100	cc.

Dance Floor Wax

Formula No. 1

Melt

a.	Paraffin Scale (Yellow, 50–52° C.)	12 g.
	Dye, Yellow or Red, Oil Soluble	25–30 g.
b.	Talc	80 g.
	Ochre, Yellow	8 g.

Mix *a* and *b* thoroughly, cool, pulverize.

No. 2

Melt

Paraffin Wax (50–52° C.)	80 g.
Carnauba Wax, Refined	20 g.

Sudan Yellow } Sudan Red }	to suit

Melt together, cool, pulverize.

Linoleum Wax

The following waxes are suitable for preservation of linoleum. The clear wax is also suitable as a floor wax or as a polish.

Clear Wax

Carnauba Wax	1 lb. 6 oz.
Ceresin Wax	1 lb. 6 oz.
Petroleum Spirits	8 lb.

Melt the two waxes together and stir in the petroleum spirits. The wax should then be ground.

Red Wax

Carnauba Wax	1½ lb.
Ceresin Wax	1½ lb.
Venetian Red, Dry	½ lb.
Petroleum Spirits	6½ lb.

Red Stain for Linoleum

Venetian Red, in Oil	1½ lb.
Boiled Linseed Oil	3 pt.
Amyl Acetate	4½ pt.

Wax Polishes

U. S. Patent 2,010,297

Formula	No. 1	No. 2
Carnauba Wax	25 g.	2.75 g.
Ceresin Wax	28 g.	3.08 g.
Beeswax, Yellow	20 g.	2.20 g.
Montan Wax	22.5 g.	2.47 g.
Calcium Stearate	4.5 g.	0.50 g.
Light Petroleum Solvent	— g.	89 g.

The four waxes should be melted together at about 200° F., or somewhat higher, and the calcium stearate then dissolved in the molten wax with gentle agitation. When the melt becomes clear, about half of the solvent is added. The solution is then cooled, to as low a temperature as 135–140° F. and vigorously agitated as by means of high speed stirrers, with the cooling continued until crystallization occurs around 100–110° F. The vigorous agitation is further continued until the batch reaches a temperature of 90–95° F., whereupon the other half of the solvent is slowly added in connection with gentle agitation. The product may then be packaged.

Wax Paste Polish

Paraffin	28 g.
Ozokerite	6 g.
Carnauba Wax, N.C. No. 3	3 g.
Beeswax, Yellow	4 g.
Turpentine	60 cc.

Emery Polishing Paste

Emery, Powdered	45 g.
Aluminum, Powdered	4 g.
Wax Paste Polish	24 g.

Wax Polish

U. S. Patent 1,979,787

Carnauba Wax	9 lb.
Light Petroleum Oil	41 lb.
Water	49.5 lb.
Starch	0.5 lb.

Wood Button Polish

Turpentine	120 cc.
Wax, White	120 g.

Melt.

Add Alcohol	50 cc.

with stirring.

Axe or Hammer Handle Wax

White Beeswax	5½ lb.
White Rosin	½ lb.
White Lead	4 lb.
Damar Varnish	⅛ lb.

Melt the beeswax; crush, melt and stir in the rosin; add white lead while stirring, and finally pour in the damar varnish. While still in a liquid state, this material is poured into small paper bags which serve as molds.

Another mixture contains:

White Rosin	10 lb.
Paraffin	2 lb.
White Lead	2 oz.
Linseed Oil	½ lb.

The finished product looks like beeswax, but is lighter in color. The rosin and paraffin are melted and mixed and allowed to cool somewhat before stirring in the white lead and linseed oil—this to prevent foaming.

Liquid Ski "Waxes"

Formula No. 1

Shellac	90 g.
Sandarac	10 g.
Alcohol	200 g.

Use solution to spread over the lower surface of the ski, from the top down, to about 10 cm. below the straps. Dry, and repeat spreading. For low temperatures, when snow has too much friction, add 1–2% Castor Oil.

No. 2

Carnauba Wax	4 g.
Montan Wax	12 g.
Linseed Oil Varnish	84 g.

No. 3

Montan Wax, Refined	15 g.
Ceresin	3 g.
Turpentine Oil Substitute	82 g.

No. 4

Colophony	30 g.
Ceresin	25 g.
Tallow	55 g.

No. 5

Talc	10 g.
Palm Oil	14 g.
Ceresin	16 g.
Paraffin	60 g.

No. 6

Tallow	125 g.
Colophony	275 g.
Montan Wax	400 g.
Turpentine Oil	200 g.

No. 7

Rice Starch	40 g.
Tallow	125 g.
Larch Turpentine	260 g.
Yellow Wax	500 g.

No. 8

(Sohm's Ski Wax)

Ozokerite	55 g.
Tallow	15 g.
Rosin	30 g.

All these waxes may be thinned with turpentine oil to desired fluidity.

Norwegian Klister (Ski) Waxes

Formula No. 1

Rice Starch	40 g.
Tallow	125 g.
Larch Turpentine	260 g.
Yellow Wax	500 g.

No. 2

Paraffin (40–42° C.)	60 g.
Colophony	12 g.
Wool Fat	6 g.
Carnauba Wax	4 g.
Montan Wax	80 g.

No. 3

Ozokerite	55 g.
Colophony	35 g.
Spindle Oil, Refined	10 g.

No. 4

Paraffin	70 g.
Colophony	15 g.
Wool Fat	10 g.
Carnauba Wax	5 g.
Montan Wax	15 g.

No. 5

Ozokerite	5 g.
Colophony	4 g.
Train or Spindle Oil	1.5 g.

No. 6

Montan Wax, Crude	120 g.
Paraffin	30 g.
Wool Fat	20 g.
Seal Train Oil	15 g.
Tallow, Hard	10 g.
Rosin	5 g.
Wood Tar	3 g.

No. 7

Paraffin	1 g.
Tallow	1.5 g.
Rosin	2.5 g.
Ozokerite	15 g.

No. 8

Wool Fat	10 g.
Ceresin	90 g.

Ski Wax

Formula No. 1

Montan Wax, Crude	18 g.
Paraffin Wax	60 g.
Ozokerite	4 g.
Wool Fat	6 g.
Colophony	12 g.

Melt together and add turpentine oil to desired consistency.

No. 2

Ascension Wax:

Ceresin	10 g.
Paraffin Wax	20 g.
Wool Fat	28 g.
Colophony	15 g.
Montan Wax	27 g.

Melt together and add turpentine to desired consistency.

No. 3

Gliding Wax:

Paraffin Wax	60 g.
Ceresin	16 g.
Tallow	14 g.

Melt together and add turpentine to suit.

No. 4

Gliding Wax:

Black Ozokerite	55 g.
Rosin	30 g.
Tallow	15 g.

Melt together and add turpentine to suit.

No. 5

Paraffin Wax	30 g.
Montan Wax, Bleached	80 g.
Colophony	20 g.
Japan Wax	20 g.
Wood Tar Oil	10 cc.
Turpentine Oil	10 cc.
Yellow Dyestuff	enough to color

No. 6

Wax Polish, White:

Paraffin Wax	16 g.
Carnauba Wax, Light	3 g.
Beeswax, White	1 g.
Turpentine	46 cc.

No. 7

Wax Polish, Liquid:

Paraffin Wax	50 g.
Ozokerite	5 g.
Carnauba Wax	100 g.
Turpentine Oil	750 cc.
Benzoline	94 cc.
Camphor Oil	2 g.
Amyl Acetate	3 cc.

No. 8

For Gliding:

Paraffin (50–52° C.)	60 g.
Ceresin (60° C.)	16 g.
Tallow or Palm Oil	14 g.
Talcum	10 g.

No. 9

For Climbing:

Paraffin (40–42° C.)	50 g.
Rosin	20 g.
Wool Fat	15 g.
Wood Tar	15 g.

No. 10

Climbing and Sliding Ski Wax:

Paraffin	40 g.
Montan Wax, Crude	15 g.
Wool Fat, Neutral	15 g.
Rosin	10 g.
Mineral Oil	15 g.
Wood Tar	5 g.

No. 11

Climbing Wax:

Montan Wax, Crude	17 g.
Wool Fat, Neutral	18 g.
Paraffin	10 g.
Rosin	28 g.
Ozokerite	25 g.
Mineral Oil	5 g.
Wood Tar	2 g.

Ski Finishes

For running on wet snow.

Mix:

Pine Tar	25 g.
Copal Lacquer	25 g.
Venice Turpentine	50 g.

This mixture is boiled in on the running side of the ski with a blowtorch. Before using the ski rub in a thin coating of Venice turpentine.

For running on very cold snow burn in a good coating of Pine tar and before using heat ski and rub on some spermaceti.

High-Luster Polish for Shoes

Formula No. 1

a.	Carnauba Wax, Yellow	500 g.
	Carnauba Wax Residue	500 g.
	Montan Wax, Bleached	500 g.
	Paraffin. (50–52° C.)	200 g.
	Colophony	150 g.
b.	Water	8500 cc.
	Potash, Caustic	300 g.
	Olive Oil Soap	100 g.
c.	Turpentine Oil or Substitute	1500 cc.

Melt up *a*, saponify with *b*, stir until cool, and add *c*, shortly before solidified.

No. 2

Montan Wax, Crude	6 g.
Carnauba Wax	3 g.
Ozokerite (58–60° C.)	2 g.
Candelilla or Shellac Wax	3 g.
Paraffin Scales (50–52° C.)	14 g.
Nigrosine Base	3 g.
Turpentine	20–30 cc.

Shoe Polish Paste

Carnauba Wax, Fat-Gray	6 g.
Montan Wax, Bleached	7 g.
Paraffin (50–52° C.)	11 g.
Ozokerite	2 g.
Dyestuff	2 g.
Thinner (Turpentine Oil, or substitute or a Mixture of Both)	72 cc.

Shoe Polish

British Patent 395,538

Paraffin	14 g.
Ozokerite	3 g.
Carnauba Wax	3 g.

Melt 80–90° C.

Turpentine Oil	38 cc.

Stir now with

Water (boiling)	38 cc.
Sodium-Sulphonate of Glycol Mono-Oleate	1 g.

Dyeing Shoe Polish, Liquid

Carnauba Wax, Fat-Gray	2 g.
Montan Wax, Bleached	2 g.
Paraffin (50–52° C.)	4 g.
Ozokerite, Refined	1 g.
Dyestuff	1.5 g.
Thinner (Turpentine Oil, or Substitute, or Mixture of Both)	89.5 cc.

Sporting Shoe Dressings, Paste

Formula No. 1

Shoe Paste, Black

Carnauba Wax, Gray	7	g.
Montan Wax, Crude	7	g.
Paraffin (50–52° C.)	12	g.
Black Dye, Oil-Soluble *	3	g.
Thinner (Turpentine Oil, or Substitute, or a Mixture of Both)	51	cc.
Vaseline Oil	20	cc.

No. 2

Carnauba Wax	5	g.
Montan Wax, Crude	8	g.
Paraffin (50–52° C.)	9	g.
Black Dye, Oil-Soluble *	3	g.
Thinner (see above)	60	cc.
Spindle Oil, Refined	15	cc.

No. 3

Carnauba or Shellac Wax	8	g.
Montan Wax, Crude	8	g.
Paraffin (50–52° C.)	10	g.
Black Dye, Oil-Soluble *	3	g.
Thinner (see above)	51	cc.
Spindle Oil, Refined	10	cc.
Sardine Train Oil	10	cc.

Sporting Shoe Polishes, Liquid

Formula	No. 1	No. 2	No. 3
Carnauba Wax, N.C.	3 g.	3 g.	4 g.
Montan Wax, Crude	2 g.	2.5 g.	2 g.
Paraffin (50–52° C.)	3 g.	2.5 g.	2 g.
Black Dye,* Oil-Soluble	3 g.	3 g.	3 g.
Thinners (see above)	75 cc.	72 cc.	70 cc.
Spindle Oil, Refined	14 cc.	—	19 cc.
Vaseline Oil	—	11 cc.	—
Sardine Train Oil	—	6 cc.	—

* Black Dyes

Nigrosine Base	51017
Nigrosine Base	4322
Nigrosine Base	LJF
Nigrosine Base	SRN
Nigrosine Base	SR
Nigrosine Base	C

How to dissolve the Black Dye:

a. Olein	1	g.
Montan Wax, Raw	1	g.
Nigrosine Base	1	g.

Warm together and stir.

or

b. Stearin	2	g.
Nigrosine Base	1	g.

Black Shoe Polish

Carnauba Wax	6	g.
Montan Wax, Crude	5	g.
Soft Ozokerite (58–60° C.)	1	g.
Nigrosine Base	3	g.
Paraffin (58–60° C.)	14	g.
Turpentine	71	cc.

Powder Glaze for Shoes

Shellac	18	g.
Borax	7½	g.
Water	75	g.

Dissolve and then evaporate water until dry and then pulverize.

Shoe Cream for Collapsible Tubes

a. Water	52	cc.
Nigrosine	1	g.
Potassium Carbonate	0.5	g.
Hard Soap	0.75	g.

Boil.

b. Montan Wax, Crude	7	g.
Japan Wax	2.5	g.
Carnauba Wax, Gray	4	g.
Beeswax	2.5	g.
Paraffin (50–52° C.)	2	g.
Oil-Soluble Black	2.5	g.

Pour *b* molten into hot *a*. To the homogeneous (cooled) mass add while stirring

c. Turpentine	25	cc.

Notes on Cleaning White Shoes

Important note—all cleaners should be applied sparingly. It is best to place the shoes to be cleaned on the shoe trees and with a dry cloth remove surface dust or dirt. Do not clean white shoes while on the feet.

Apply the cleaner sparingly to a clean white cloth, preferably toweling, and first clean the dirtiest spot, then go all over the shoe, using sufficient pressure to remove all spots and stains. Avoid saturating the leather but apply evenly over the entire area to be cleaned.

Permit shoes to dry thoroughly. Next rub the shoe briskly with a clean dry cloth, removing all white particles of powder and until the original sheen is restored.

In the case of white buck or suede shoes, a fine bristle brush will more easily remove excess powder and raise the nap of the leather.

Do not use soap and water on elk shoes. Beware of a cleaner with so much alkali

that repeated usage will remove the finish. This generally results in the hardening of the elk leather so that it cracks or shrinks.

White Shoe Polishing Stick

Carnauba Wax, Flora	4 lb.
Stearic Acid	4 lb.
Paraffin Wax	17 lb.
Montan Wax, Bleached	16 lb.
China Clay	9 lb.
Titanium Dioxide	1 lb.

White Shoe Dressing

Titanox A	10.5 oz.
Titanox B	20.75 oz.
White Soap	3 oz.
White Dextrin	3 oz.
Ammonia	1.25 oz.
Water	48.40 oz.
Carbon Tetrachloride	13.25 oz.
Moldex or Other Preservative	10 oz.

Shoe White (Water Type)

This cleaner for white canvas and leather shoes cleans and whitens at the same time and leaves a coating which does not dust or rub off.

Lithopone	28 oz.
Asbestine	4 oz.
Gum Arabic	7.5 oz.
Gum Tragacanth	0.3 oz.
Benzoate of Soda or Moldex	0.5 oz.
Ultramarine	sufficient to whiten
Perfume	sufficient to give pleasant odor
Water	59.7 oz.

If better hiding power is desired titanium dioxide pure or titanium dioxide with a barium or calcium base may be used; as well as pure zinc sulphide. The asbestine is added to prevent the pigment from packing hard on long standing. The tragacanth gives added body or viscosity, and inhibits much of the pigment from settling, a mere inversion of the bottle being adequate to bring same back into suspension.

Shoe White (Waterproof Type)

This composition leaves a coating which is waterproof and does not dust off. It is preferred to the water type for leather shoes particularly the glazed type.

Lithopone	28 oz.
Asbestine	4 oz.
Ultramarine	sufficient to whiten
Ester Gum, Pale	5 oz.
Solvent Naphtha	62 oz.
Aluminum Stearate	1 oz.
Perfume	sufficient to mask petroleum odor

The solvent naphtha should be a petroleum fraction boiling between 200° and 300° F. The aluminum stearate is dissolved in same to increase the viscosity and inhibit settling of the pigments. The ester gum is then added and stirred or heated until solution is complete. The perfume and pigments are then added.

White Shoe Cleaner

a. Titanox C	30 g.
b. Diglycol Laurate	6 cc.
Varnolene	10 cc.
Toluol	12 cc.

Mix *a* and *b* thoroughly.

c. Bright Drying Carnauba Wax Emulsion	60 cc.
Water	20 cc.

Add *c* to *ab* in 4 equal portions, shaking or stirring during and after each addition.

d. Trichloroethylene	40 cc.

Add slowly with stirring.

White Shoe Dressing

Titanium White	60 g.
Diglycol Oleate	12 g.
Naphtha	20 g.

Stir the above together and while stirring vigorously add slowly

Carnauba Wax Emulsion (10% Wax)	80 g.

then stir in vigorously

Trichloroethylene	60–100 g.

Polishing Cloths

Prepare powder mixtures:

Formula No. 1

Calcium Carbonate	70 g.
Kieselguhr	25 g.
Caput Mortuum	5 g.

No. 2

Magnesia, Calcined	20 g.
English Red	40 g.
Vienna Lime	40 g.

No. 3

Calcium Carbonate	40 g.
Bolus	20 g.
Vienna Lime	20 g.
Infusorial Earth	10 g.
Magnesia Usta	5 g.

One hundred and fifty grams of these mixtures are stirred into 1000 cc. of

water, impregnate the cloths in this suspension. Press. Dry (40–50° C.). Fix with a bath of 100 g. hard soap in 1000 cc. water. Press and dry again.

Cleansing and Polishing Compositions
British Patent 425,323

A cleansing and polishing liquid which leaves a thin film on the leather, wood, metal, or other article treated, is composed of a hard wax polishing composition, alkali, water, a solvent of oil and fat, carbon tetrachloride shellac, and bornyl acetate. For example, 3 lb. of shellac wax, 3 lb. of montan wax, 3 lb. of carnauba wax, 2 lb. of paraffin wax, 1 lb. of japan wax, 1 lb. of acetone varnish, 1 lb. of nitrocellulose varnish, 1 lb. of cellulose varnish, 3 lb. of potash or soda, 20 lb. of water, 1 lb. of castor oil, 5 lb. of white spirit, 40 lb. of turpentine substitute, 20 lb. of carbon tetrachloride, 1 lb. of shellac, and 1 lb. of bornyl acetate are mixed together.

Pore Filler for Polish Bases
German Patent 607,521

Carnauba Wax	5 g.
Pumice Powder	100 g.
Sandarac	100 g.
Castor Oil, Blown	10 g.
Shellac Wax	10 g.

Melt up while stirring, cool, and pulverize. The "Pore Filler" is then applied as usual by rubbing it in on the wood surface together with the polishing liquid.

Abrasive Wheel
Formula No. 1
British Patent 411,846

One hundred parts abrasive grains are coated with 1 part of a resin solvent, e.g., di-butylphthalate, and 6–20 parts of finely divided glycerol-phthalic anhydride reaction product are added, the mixture is warmed to 350° F. to make it plastic and passed several times between rollers, covered with a thin film of linseed oil and maintained at 150° F., and, after final sheeting, articles are cut out and hardened for 48 hours at 350° F.

No. 2
British Patent 434,402

Diamond Dust	26 oz.
Graphite	50 oz.
Charcoal	50 oz.
Red Iron Oxide	75 oz.
Phenol Formaldehyde Resin	sufficient to bond

Hardness Scale for Abrasives

A scale of hardness based on the lapping method is as follows: bort 10, ballas 9.99, carbonado 9.82, boron carbide 9.32, black silicon carbide 9.15, corundum 9.00.

PYROTECHNICS

Fireworks (Pyrotechnics)

The greatest care should be exercised in making fireworks. Carelessness and impurities produce most accidents. Do not mix large amounts of ingredients and do not permit the introduction of dirt, dust or other foreign matter. Do not mix near your stock of raw or finished material. Make sure that all utensils are cleaned directly before use. Slight friction, even that produced by sifting may cause an explosion or fire. All packing or ramming should be done gently and without scratching as the latter may start a reaction just as well as a shock.

Do not allow matches or open flames in the mixing room. Wear rubber soled shoes. Keep the air moist enough to prevent static sparks from being generated by moving bodies.

All chemicals used should be of best quality and bought from a reliable house in original packages. These should be kept air-tight. For mixing small quantities round brass wire sieves (No. 16–26) are used. In plain mixings the coal is weighed first and put into bottom of a wooden tub; the sieve is put on top and the sulphur and saltpeter sifted through it. Then with bare arms mix the powder in the tub thoroughly. Place sieve on another tub and sift from first tub a scoopful at a time. Mix with hands again and sift back again into first tub.

In "colored" mixings each ingredient should be sifted separately the first time except the shellac, coal, etc., which is put in bottom of tub. Never throw the chlorate on the sieve with dextrin or other organic material. Beware of hitting the sieve with finger nails or metallic objects.

Sparklers

Formula	No. 1	No. 2
Lampblack	36	— lb.
Powdered Charcoal	—	25 lb.
Steel Filings	30	50 lb.
Aluminum Powder	15	— lb.
Gum Arabic	6	5 lb.
Saltpeter	5	15 lb.
Sulphur	2	6 lb.

The gum arabic is worked up with water into the consistency of mucilage, the other items except the steel filings are stirred in. The steel filing lightly coated with paraffin is finally added. Then work the mixture up to the consistency of porridge.

Pin Wheels

Formula	No. 1	No. 2	No. 3
Meal Powder	—	10	8 lb.
Fine Grain Powder	8	5	8 lb.
Aluminum	—	—	3 lb.
Saltpeter	14	4	16 lb.
Steel Filings	6	6	— lb.
Sulphur	4	1	3 lb.
Charcoal	3	1	8 lb.

Pyrotechnic Fountains

Meal Powder	5 lb.
Granular Saltpeter	3 lb.
Sulphur	1 lb.
Coarse Charcoal	1 lb.
FF Rifle Powder	¾ lb.

Flower Pots

Saltpeter	10 lb.
Sulphur	6 lb.
Lampblack	3 lb.
FFF Rifle Powder	6 lb.

Gerbs

Formula	No. 1	No. 2
Meal Powder	6	4 lb.
Saltpeter	2	— lb.
Sulphur	1	— lb.
Charcoal	1	1 lb.
Steel Filings	1	2 lb.

Serpents or "Nigger" Chasers

Formula	No. 1	No. 2
Meal Powder	3	3 lb.
Saltpeter	2	5 lb.
Sulphur	1	1 lb.
Mixed Coal	1½	¾ lb.
FFF Grain Powder	4	3 lb.

Snake Nests

Saltpeter	1 lb.
Ammonium Bichromate	2 lb.
Dextrin	1 lb.

Table Rocket

Formula	No. 1	No. 2
Saltpeter	8	5 lb.
Meal Powder	7	12 lb.
Charcoal	2	3 lb.
Sulphur	2	3 lb.
Steel Filings	3	— lb.

Roman Candles

Powdered Saltpeter	18 lb.
Fine Powdered Charcoal	11 lb.
Flowers of Sulphur	6 lb.
Dextrin	1 lb.
Water	1 gal.

After all the ingredients are well mixed and sifted 3 times, add the water and mix again until the whole lot is evenly dampened.

Rocket and Candle Match

Into a small tub put about a gal. of starch, well boiled, and stir into it about 5 lb. of a thoroughly mixed composition made of

Saltpeter	16 lb.
Fine Charcoal	5 lb.
Sulphur	2½ lb.

Soak in this, cotton wick of about 5 strands until nearly all the composition is absorbed but about ½ in. should still cover the cotton in the tub.

Cascades

Formula	No. 1	No. 2
Granulated Saltpeter	18	16 lb.
Mixed Charcoal	4	4 lb.
Sulphur	3	3 lb.
Iron Borings	6	7 lb.

Smoke Pot

Strontium Nitrate	10 lb.
Sulphur	6 lb.
Whiting (Chalk)	4 lb.
Fine Charcoal	¾ lb.
Dextrin	¾ lb.

or

Saltpeter	4 lb.
Lampblack	1 lb.
Charcoal	1 lb.
Red Arsenic	1 lb.
Rosin	1 lb.

Gold and Silver Rain

(Cut Stars)

Formula	No. 1	No. 2	No. 3
Meal Powder	16	—	4 lb.
Saltpeter	10	1	1 lb.
Sulphur	10	1	— lb.
Fine Charcoal	4	1	2 lb.
Lampblack	2	—	— lb.
Red Arsenic	1	—	— lb.
Shellac	1	—	— lb.
Dextrin	1	—	— lb.
Lead Nitrate	—	3	— lb.

Japanese Stars

Formula	No. 1	No. 2
Lampblack	12	6 oz.
Potassium Chlorate	8	4 oz.
Saltpeter	1	— oz.
Water	18	9 oz.
Alcohol	4	2 oz.
Dextrin	1	— oz.
Gum Arabic	—	½ oz.

Mix the dextrin and saltpeter together and add sufficient water to make a gummy liquid. Boil the balance of the water and add the potassium chlorate to it. Put the lampblack in a large pan and pour the alcohol over it working it in as well as possible. Then add the potassium chlorate in the hot water and stir with stick until cool enough for the hands and lastly add the dextrin and saltpeter.

In Formula No. 2 the potash and lampblack are sifted together several times; add alcohol; then water in which gum has been dissolved and proceed as in Formula No. 1.

White Stars

Formula	No. 1	No. 2
Saltpeter	50	54 lb.
Sulphur	15	15 lb.
Red Arsenic	15	9 lb.
Dextrin	3	3 lb.
Black Antimony	—	15 lb.
Red Lead	—	6 lb.
Shellac	—	1 lb.

Red Stars

Formula	No. 1	No. 2
Potassium Chlorate	6	24 lb.
Shellac or Red Gum	1	3 lb.
Fine Charcoal	2	4 lb.
Strontium Carbonate	—	4 lb.
Strontium Nitrate	6	— lb.
Dextrin	½	1½ lb.

Blue Stars

Potassium Chlorate	24	lb.
Paris Green	9	lb.
Barium Nitrate	8	lb.
Shellac	5	lb.
Dextrin	1½	lb.

Chinese Fire Crackers

Formula	No. 1	No. 2
Saltpeter	50	45 lb.
Sulphur	25	18 lb.
Charcoal	25	25 lb.
Potassium Chlorate	—	8 lb.
Sand	—	4 lb.

Flash Crackers

Formula	No. 1	No. 2	No. 3
Saltpeter	50	—	— lb.
Sulphur	30	25	30 lb.
Aluminum Powder, Fine	20	25	40 lb.
Potassium Chlorate	—	50	30 lb.

Cannon Cracker Composition

Formula	No. 1	No. 2	No. 3
Potassium Chlorate	60	6	6 lb.
Washed Sulphur	23	3	2 lb.
Sulphuret Antimony	5	—	— lb.
Metallic Antimony	—	—	1 lb.
Charcoal	—	1	— lb.
Saltpeter	12	—	— lb.

Each ingredient should be sifted separately and then mixed in a tub with the fingers, preferably gloved, being careful not to scratch the bottom of tub with the nails.

Japanese or Cap Torpedoes

Formula No. 1

Potassium Chlorate	5	oz.
Sulphur	¼	oz.
Chalk	¼	oz.

No. 2

Amorphous Phosphorus	2	oz.

Sift separately the ingredients of No. 1, mix thoroughly and moisten in a bowl with water until of the consistency of porridge. In another bowl moisten the 2 oz. of amorphous phosphorus, to the same consistency. Then stir the phosphorus into the bowl containing the other ingredients with a spoon.

White Fire

Formula	No. 1	No. 2	No. 3	No. 4	
Saltpeter	3	12	8	7	lb.
Sulphur	1	2	2	2	lb.
Metallic Antimony	1	—	—	—	lb.
Sulphide of Antimony	1	1	—	—	lb.
Realgar	—	—	1	1½	lb.

Red Fire

Formula	No. 1	No. 2	No. 3	No. 4	No. 5
Nitrate of Strontia	80	80	10	16	30 lb.
Potassium Chlorate	32	20	4	8	20 lb.
Shellac	24	—	—	3	1 lb.
Sheel-lac or Kauri Gum	—	12	3	—	— lb.
Charcoal	—	—	1	—	— lb.
Dextrin	—	1	—	—	— lb.
Fine Sawdust	—	12	—	—	— lb.
Rosin	—	—	1	—	— lb.
Lampblack	—	1	—	—	— lb.

Blue Fire

Formula	No. 1	No. 2	No. 3	No. 4	
Chlorate of Potash	6	8	8	12	lb.
Paris Green	4	6	6	8	lb.
Stearin	1	1	1	2	lb.
Shellac	—	½	½	—	lb.
Barium Nitrate	4	8	7	8	lb.
Calomel	—	—	1	—	lb.
Sal Ammoniac	—	1	—	1½	lb.

In order to make tableau fires more bulky, one to two parts of fine sawdust may be mixed with any of the above formulas without materially affecting the color. It should also be borne in mind that paris green is very poisonous and a handkerchief should be tied over the nose if it has to be handled much.

Green Fire

Formula	No. 1	No. 2	No. 3	
Barium Nitrate	8	9	4	lb.
Potassium Chlorate	4	3	2	lb.
Shellac	—	1	1½	lb.
Sheel-lac (Shellac Substitute)	2	—	—	lb.
Dextrin	—	1/16	—	lb.
Fine Sawdust	—	½	—	lb.
Sal Ammoniac	1	—	—	lb.

Yellow Fire

Barium Nitrate	36 lb.
Sodium Oxalate	6 lb.
Sulphur	3 lb.
Sheel-lac	5 lb.

Red Lances

Formula	No. 1	No. 2
Potassium Chlorate	16	16 lb.
Strontium Nitrate	3	— lb.
Strontium Carbonate	—	3 lb.
Shellac	3	2 lb.
Lampblack	⅛	1 lb.

Green Lances

Formula	No. 1	No. 2	No. 3	No. 4	
Potassium Chlorate	7	16	16	—	lb.
Barium Nitrate	7	4	6	—	lb.
Barium Chlorate	—	—	—	6	lb.
Shellac	2	4	3	1	lb.
Calomel	—	3	3	2	lb.
Lampblack	—	⅛	—	—	lb.
Dextrin	—	—	1	—	lb.
Picric Acid	—	—	1	1	lb.

White Lances

Formula	No. 1	No. 2	No. 3	No. 4	
Saltpeter	9	14	5	8	lb.
Sulphur	1	4	2	2	lb.
Antimony Sulphide	2	—	—	—	lb.
Antimony Metal Powder	—	3	1	—	lb.
Meal Powder	—	—	1	—	lb.
Red Arsenic	—	—	—	1	lb.

Magnesium Torches

a.	Shellac	120 g.
	Resin	120 g.
	Barium Nitrate, Dry	840 g.
b.	Magnesium Powder	25–40 g.

Mix the ground *a* with *b*, and fill into zinc-tubes (thin walls) having a wooden handle, which closes the tube below.

Parade Torches

Strontium Nitrate	40 lb.
Potassium Chlorate	8 lb.
Red Sheel-lac	7 lb.

Railway Fuses

Formula	No. 1	No. 2	No. 3	No. 4	
Strontium Nitrate	48	16	18	16	lb.
Saltpeter	12	4	7	4	lb.
Sulphur	5	2	2	5	lb.
Fine Charcoal	4	1	½	1	lb.
Red Sheel-lac	10	3	2	—	lb.
Dextrin	—	—	½	—	lb.

Ship Distress Signals

Potassium Chlorate	5 lb.
Strontium Carbonate	1½ lb.
Shellac	1 lb.
Dextrin	1½ lb.

Miracle Candles

a.	Iron, Powdered	25 g.
b.	Barium Nitrate	52 g.
c.	Aluminum Powder	8 g.
d.	Starch, Wheat	15 g.

Right size of the iron grains is most important, *b* and *c* should be finely powdered.

Should be produced in summer for quicker and more economical drying. Mixture must be perfect, pack in air-tight drums.

Put into an enameled container (best way using 1 kg. mass), make a little hole in the center of the powder, pour in it the least possible amount of boiling water (100 g. for 1 kg. powder), and stir the whole thoroughly. The right point of pastification and right amount of water is reached when the paste is not too friable or too sticky and forms a concrete non-sticky mass.

This mass is put on wires (2 g. per wire), and dried.

Orange Smoke
U. S. Patent 1,975,785

A pyrotechnic composition for producing orange smoke, comprises lead peroxide 50 parts, potassium bichromate 35 parts, and magnesium 15 parts.

Brown Smoke
U. S. Patent 1,975,099

A pyrotechnic composition for producing brown smoke, comprises copper oxide 50 parts, lead peroxide 35 parts, and magnesium 15 parts.

Pyrotechnical Device
U. S. Patent 1,936,221

A firework of the "sparkler" type consists of an iron rod coated at one end with a plastic mixture of barium nitrate

85, strontium carbonate 60, sodium aluminum fluoride 40, potassium chlorate 225, dextrin 30, and shellac 55 all parts by weight in which are embedded granules of magnesium-copper or magnesium-aluminum alloy.

Explosives

Formula No. 1

British Patent 408,260

Explosives consist of alpha-trinitrotoluene 10–30, *o*-nitrotoluene 5–10, ground coconut fiber or charcoal 1–5, paraffin or other suitable wax 3–6, aluminum, graded 50-mesh, 10–24, finely powdered aluminum 1–4, and barium nitrate, or other nitrate, 70–21 parts.

No. 2

British Patent 412,583

A nitrated mixture of glycerol and glycol 15, ammonium nitrate 8.5, sodium nitrate 12.0, plant fiber 6, sodium chloride 58 and ammonium orthophosphate 0.5%, has a density of 1.1 g. per cc. and gives a ballistic pendulum swing of 1.08 in., the volumetric power factor being 1.19.

No. 3

British Patent 435,588

Ammonium Nitrate	90 lb.
Aluminum Powder	6½ lb.
Manganese Dioxide Powder	3½ lb.

Slow-Burning Explosives

British Patent 423,040

Examples of slow-burning explosives are (1) potassium nitrate 75 or sodium nitrate 73, charcoal 15 or 17 and sulphur 10, (2) sodium nitrate 44, ammonium nitrate 34 and charcoal 22%. The explosive may be granular or compressed in pellets and may contain small quantities of cooling salts and boric acid or borates.

Explosive Priming Mixture

British Patent 432,096

A suitable composition is the potassium salt 16, basic lead salt of trinitroresorcinol 15, barium nitrate 40, and antimony sulphite 29%.

Priming Charge

Canadian Patent 348,291

A solution containing potassium nitrate 30, barium nitrate 20, and water 100 parts is crystallized at 50° C. to give a double salt, which when used in priming charges leaves substantially no corrosive residues nor fused masses in the barrels of firearms; e.g., a priming charge consists of mercury fulminate 20–45, potassium barium nitrate 30–60, lead thiocyanate 10–40% by weight.

Priming Composition

German Patent 614,712

The composition contains zirconium powder in addition to the usual constituents. Thus, the composition may contain zirconium powder 10, barium nitrate 40, mercuric fulminate 25 and antimony trisulphide 25%.

Flash Composition

U. S. Patent 1,964,077

A suitable mixture contains perchlorate 20, potassium chlorate 39.5, silver nitrate 39.5, and nitrocotton 1.0%.

Flashlight Cartridges

British Patent 419,658

A cartridge is charged with a powder mixture consisting of magnesium 700–900, sulphur 10–18, potassium permanganate or potassium chlorate 100–140, potassium nitrate 70–85, magnesium oxide 100–160 and charcoal 10–13 parts.

Black Powder

Canadian Patent 348,641

The addition of 0.1–5.0% by weight of stearic acid retards the burning speed of black powder. E.g., a black blasting powder contains sodium nitrate 72.0, sulphur 10.0, charcoal 17.7 and stearic acid 0.3%.

Fuse Powder

French Patent 783,249

A powder of long combustion is made by dissolving niter 5, pulverized sulphur 4 and wood charcoal 3.5 parts in pure alcohol to form a thick mass which is well mixed and dried.

Gelatin Dynamite

Canadian Patent 352,763

The following percentage compositions are specified:

Formula No. 1

Nitroglycerin	47
Dinitrotoluene	3

Nitrocotton	1.3
Sodium Nitrate	36.1
Expanded Cereal Product	9
Starch	2.7
Chalk	0.9

No. 2

Nitroglycerin	60
Dinitrotoluene	3.5
Nitrocotton	2.3
Sodium Nitrate	2.2
Ammonium Nitrate	24
Expanded Cereal	6
Starch	1
Chalk	1

No. 3

Nitroglycerin	30
Dinitrotoluene	2
Nitrocotton	0.7
Sodium Nitrate	44.8
Ammonium Chloride	15
Expanded Cereal Product	2
Starch	4.5
Chalk	1

No. 4

Nitroglycerin	22
Dinitrotoluene	1.5
Nitrocotton	0.2
Sodium Nitrate	9
Ammonium Nitrate	60
Expanded Cereal Product	6.9
Chalk	0.4

Detonators

French Patent 781,646

A composition which is fired directly by the passage of an electric current comprises a mixture of finely divided zirconium and a nitrophenol salt of lead, e.g., zirconium 70 and lead mononitro-resorcinate 30 parts in sufficient amount of a 5% solution of nitrocellulose in amyl acetate to make a creamy mixture.

Percussion Detonator

U. S. Patent 1,975,679

A percussion detonating composition consists of phosphorus sesquisulphide 30 g., gum arabic 115 g., magnesium carbonate 20 g., calcium carbonate 5 g., potassium chlorate 80 g., iron sesquioxide (red ochre) 40 g.

Waterproofing for Blasting Fuses

(Non-Staining)

U. S. Patent 1,968,907

Petrolatum	25–90 lb.
Ester Gum	5–75 lb.
Paraffin Wax	5–50 lb.

Caoutchouc (Rubber) Synthetic

Acetylene is absorbed by a mixture of

Cuprous Chloride	1000 g.
Ammonium Chloride	400 g.
Copper	100 g.
Hydrochloric Acid Concentrate	30 g.
Water	425 g.

at 40–50° C. The saturation is reached, when 50 g. of acetylene have been absorbed (3 hours). The mixture is kept at ordinary temperature during 24 hours, then distilled on an oil bath. The distillate contains 33% of

$$CH_2 = CH - C \equiv CH, \text{ and}$$

67% of superior condensation products, among which has been found

$$CH_2 = CH - C \equiv C - CH = CH_2,$$

and C_8H_8.

In the same process, the yield in

$$CH_2 = CH - C \equiv CH$$

falls, when the period between saturation and distillation is increased to 140 hours.

A 70% yield is obtained when running the absorption at 80° C., and collecting the gas of reaction into two receivers, the first chilled in ice, the second in carbon dioxide snow. The liquid in the second receiver contains:

$$CH_2 = CH - C \equiv CH$$
$$CH \equiv CH$$
$$CH_3 - CHO$$

The chloroprene is obtained with an 80% yield, agitating

$$CH_2 = CH - C \equiv CH \text{ with}$$

Hydrochloric Acid, Concentrate	70 g.
Cuprous Chloride	10 g.
Ammonium Chloride	4 g.

for 3 hours at room temperature.

Rubber Master-Batch
U. S. Patent 1,942,853

Substantially unmasticated crude rubber (1 lb.) is superficially treated with ½–3 lb. of a softener, e.g., mineral oil, so that the latter is absorbed. This procedure obviates the difficulties of incorporation of liquid softeners in the usual manner, and the soft, non-tacky product is very easily mixed with other compounding ingredients.

Porous, Fibrous Rubber Compositions
British Patent 409,294

A porous, non-waterproof, fibrous, felt-like material is prepared by admixture of rubber with finely comminuted (not powder) fibers of wool and hair in proportions of not more than 50% rubber and not less than 50% fibers together with an amount of non-liquid expanding agent, e.g., ammonium carbonate, sodium carbonate, sodium potassium carbonate, sodium bicarbonate, ammonium bicarbonate that will expand the mass 2–6 times. Vulcanization and coloring agents and softeners may be added. In an example sulphur 7.5, zinc oxide 6, ferric oxide 2, stearic acid 4, ultra-accelerator 1 oz. and comminuted wool 22.5 lb. are added to 15 lb. softened rubber. When cool ammonium bicarbonate is added and the product calendered into sheets.

Rubber Fibers
German Patent 614,615

Rubber fibers are formed by introducing a coagulating agent through nozzles into rubber latex. Thus, a 60% solution of acetic acid is fed into a rubber latex mixture of rubber 92.5, sulphur 2.5, zinc oxide 2.5, anti-oxidation agent 1.0, accelerator 0.5 and ammonium oleate 1%, through 0.42 mm. nozzles, the fiber being removed at 600–760 cc. per minute.

Chlorinated Rubber
British Patent 410,249

A solution of unvulcanized (artificial or reclaimed) rubber, gutta-percha or balata, with or without factice, admixed with 5–20% uncombined sulphur is chlorinated to yield a thermoplastic mass suitable for the manufacture of films, varnishes or moldable compositions,

the chlorination being continued until the gel which forms is entirely redissolved. Metallic halides, oils, turpentine, chlorinated naphthalenes, tritolyl phosphate, organic esters, ethereal oils, cellulose plastic softeners, synthetic resins or varnishes may be added before, during or after chlorination. In an example, 10 g. masticated crepe in 200 cc. carbon tetrachloride is mixed with 1 g. sulphur and heated with chlorine until the gel formed redissolves to form a mobile liquid and the product is precipitated by adding 100 cc. alcohol and washed in boiling water to give a white mass containing 32% chlorine, soluble in acetone and benzol to yield a transparent, colorless film moldable at 130° C. If the chlorination is stopped before resolution, the gel which rises to the surface being removed, washed with solvent, treated with boiling water and dried, the product will be a semitransparent, hard, tough, elastic substance moldable at 130–140°.

De-Polymerization of Rubber
German Patent 599,405

Rubber can be de-polymerized to give 40–60% solutions by treatment in suspension or solution with 10% of its weight of 53% nitric acid. A paste is first prepared by stirring 10 kg. rubber in 90 kg. benzol, whereupon 1 kg. of the 53% nitric acid is stirred in and the de-polymerization interrupted at the desired stage by neutralization with ½ kg. barium carbonate.

The de-polymerized rubber solution is decanted off and concentrated if necessary by evaporation. Coatings of this form of rubber are somewhat tacky but this defect can be remedied by a partial re-polymerization (immediately after the neutralization stage) with antimony trichloride or phthalic acid in alcoholic solution.

Cork-Rubber Composition
British Patent 425,699

Rubber	100 lb.
Cork	100 lb.
Sulphur	3 lb.
Zinc Oxide	5 lb.
Stearic Acid	2 lb.
Mercaptobenzothiazole	0.5 lb.
Zinc Isopropylxanthate Piperidine-l-Carbothionolate	0.5 lb.
Paraffin	5 lb.
Nonox S	1 lb.
Lithopone	25 lb.
Chromium Oxide, Green	15 lb.

Cork Composition
Canadian Patent 348,152

A mixture of phenol 13, paraformaldehyde 8 and diethylene glycol 30 parts by weight is heated to 210° F., 6.4 parts by weight of a 16% solution of caustic soda is added as a catalyst, and the heating is continued at about 210° F. until a sample of the liquid taken off will set in 10 minutes in boiling water. The product is immediately mixed with ground cork in the proportion of 80 lb. of the liquid and 150 lb. of cork particles. The treated cork is placed in a mold at about 300° F., where the reaction is completed and the comminuted cork is agglomerated into a cohesive mass of the desired shape.

Coating for Rubber Goods
British Patent 427,228

Latex	100 lb.
Glue	1–5 lb.
Barytes	100 lb.
Titanium Dioxide	50 lb.
Rosin Oil	10 lb.
Casein	5–20 lb.
Sulphonated Castor Oil	5 lb.
Ammonia (28%)	8 lb.
Formaldehyde	10 lb.
Color	to suit

Water sufficient to give a final concentration of total solids of 45–50%.

Thermoplastic Hornlike Rubber
German Patent 615,050

Treat rubber with 70% hydrofluoric acid for 24 to 48 hours.

Rubber Curing Solvents

Formula No. 1

Carbon Bisulphide	50 gal.
Petroleum Naphtha (140–220° F.)	50 gal.
Sulphuryl Chloride	1 gal.

No. 2

Carbon Tetrachloride	50 gal.
Petroleum Naphtha (140–220° F.)	50 gal.
Sulphuryl Chloride	1 gal.

Fire-Resistant Rubber
U. S. Patent 1,966,271

Formula No. 1

A solution of 100 parts ammonium chloride, 6 parts ethylene glycol, and 3 parts glue in 300 parts of water is added to 3 parts of an antioxidant comprising

a mixture of the condensation products of acetaldehyde with α-and-β-naphthylamines, the antioxidant being wetted with a little alcohol. Sponge rubber is soaked in this solution and the excess squeezed out until the "wet" gain in weight is 120% on the dry weight. It is dried in a current of warm air. Sponge rubber treated in this way will not burn unless held continually in a flame, and on withdrawal from the heating flame, the sponge at once ceases to burn.

No. 2

Five parts casein are dissolved in ammonia solution, the bulk made up to 300 parts and 100 parts ammonium chloride dissolved in it. The sponge rubber is soaked in this solution and the excess squeezed out so as to leave in the sponge a quantity of solution equivalent to 120% of the weight of the dry sponge rubber. This is then dried in a current of warm air. The degree of fire-resistance can be adjusted by alterations in the proportion of ammonium chloride present.

No. 3

Excess selenium is boiled for 30 minutes with 20% ammonium sulphite solution and the solution obtained is filtered through glass wool. The sponge rubber is soaked in this solution and squeezed out until the increase in weight is 55% of the dry weight, and dried in a current of warm air. The selenium is slowly deposited spontaneously by exposure.

No. 4

Sponge rubber impregnated as in the preceding case with a solution of selenium in ammonium sulphite is exposed to an atmosphere of sulphur dioxide for liberation of the selenium. Alternatively finely powdered selenium is rubbed on to the surface and into the surface pores of sponge rubber so that some is permanently retained. The extent of fire-resistance depends upon the quantity of selenium retained.

No. 5

Sponge rubber soaked in a 20% solution of ammonium silico-fluoride is squeezed out until the gain in weight is 150% of the dry weight. It is dried in a current of warm air. Sponge rubber treated in this way will not burn unless heated continually in a flame, and on withdrawal from the heating flame at once ceases to burn.

No. 6

Thirty parts of finely powdered ammonium chloride are stirred into 100 parts of a 1% solution of rubber in benzene, and the suspension obtained is painted on to the surface of the sponge rubber. The solvent is allowed to evaporate and the surface is dusted with French chalk. The fire-resistance of the sponge rubber is markedly improved. A similar suspension of ammonium silicofluoride in a benzene solution of rubber has a like effect.

It is to be understood that the quantity of fire-preventing agent remaining in the pores is not sufficient to fill the latter in any case; that the porous structure is not changed and that the agent is deposited as a superficial coating on the inner surfaces of the pores.

Fireproofing Rubber
British Patent 432,551

Five to fifteen per cent of any of the following is incorporated in the rubber:

Triphenyl Phosphate
Tricresyl Phosphate
Triphenyl Borate

Rubber Calender Liner

The handling of miles of calendered sheet involves either efficient dusting methods, to permit rolling up of the sheet without risk of adhesion, or alternatively a good non-adhesive cloth that can be rolled up with the rubber. Where the sheet has subsequently to be cut into shapes and built up, its tackiness is important, so that dusting becomes out of the question in industries such as tire and footwear manufacture.

Gelatin	75 lb.
Glycerin, Commercial	85 lb.
Talc	30 lb.
Dye, Color to Suit	10 lb.
Water	800 lb.

The cotton is treated with this mixture on both surfaces and dried. It is then hardened by passing through a bath of 10% formaldehyde solution, dried, and pressed on a calender.

One thousand square meters of cotton sheet can be covered with 37.5 kg. gelatin, 42.5 kg. glycerin, 15 kg. talc, 0.5 kg. dye, and 25 kg. formaldehyde.

Rubber Mold Lubricant

Sodium Hyposulphite	280 g.
Sugar	70 g.
Magnesium Sulphate Crystals	30 g.
Glycerin	15 g.

Hexamethylene Tetramine	1.5	g.
Phenol	2	g.
Sodium salt of the sulphuric acid derivative of the reaction product of normal butyl alcohol and a mixture of approximately 85% ortho hydroxy diphenyl and substantially 15% para hydroxy diphenyl	5	g.

The composition thus prepared is added to substantially 20–30 times its weight of water. When applied on the surface of molds and press plates, which contact with rubber or other material to be vulcanized or molded, the film produced is markedly tough and resists rubbing off when the rubber or other material is pressed into the mold.

Lubricant for Vulcanizing Molds

Sodium Hyposulphite	3	lb.
Ammonium Carbonate	1	lb.
Water	97	lb.

Non-Adhesive Mold Liner

To a mixture of casein 45, glycerol 45, and kaolin 10 parts, add water to the required consistency. Apply 2–3 times on both sides of the cotton material. Dry 1–1½ hours. Then treat with formaldehyde. The total time is 6–7 hours.

Aqueous Latex Dispersions for Artificial Leather

A mixture composed of "smoked sheets" (rubber) 100, gasoline 200, oleic acid 8, 25% ammonium hydroxide solution 20, casein 20, sulphur 8, zinc oxide 10, "Kaptax" 2, thiuram 1 part and water in accordance with requirements, produces stable emulsions when diluted with up to 50 volumes of water. A leather substitute of good physical and mechanical properties is obtained from rubber 100, rosin 19, oleic acid 5, wheat flour 15, glue 5, kaolin 10 and sulphur 5 parts.

Rubber Films and Threads

A hydrochloric additive product (1) is prepared, in 100% yield, by treating a 2% benzol solution of rubber with hydrochloric acid at 16.5–19° C.; after 15 hours the product is separated by precipition with alcohol. Glossy, transparent films may be prepared by spreading chloroform solution of (1) on a glass plate and allowing it to evaporate at 45–50° C. The films adhere to metals and may be dyed; they may be combined with plasticizers, which reduce the strength but increase the extensibility. Threads may be prepared by dry spinning from a 7% chloroform solution of (1). The material is not readily combustible, and is but little acted on by hydrochloric acid (concentrated and 2N), potassium hydroxide (20% and 2N), soap solutions, or 4N-sulphuric acid. Decomposition is effected by treatment with concentrated sulphuric or nitric acid or by prolonged heating at 55–60°.

Hard Rubber Coating
U. S. Patent 2,023,582

A method of applying a hard rubber coating to articles comprises mixing substantially 500 g. of smoked sheet rubber, 180 g. of sulphur, 2½ g. of diphenylguanidine, and 2½ g. of mercaptobenzothiazole, dissolving the mixture in substantially 2500 g. of benzine, applying the solution to an article to form a coating and vulcanizing the coating.

Wire Insulation Compound

The following formula provides an insulating compound capable of extremely rapid vulcanization and yet one which, when mixed and applied in accordance with the process defined, does not vulcanize during the extruding operation.

Smoked Sheet Rubber	22	g.
Reclaimed Rubber (Boot and Shoe)	10	g.
Reclaimed Rubber (Whole Tire)	10	g.
Mineral Rubber	5	g.
Whiting	44.7	g.
Zinc Oxide	2.5	g.
Antioxidant	1.5	g.
Sulphur	1	g.
Softener (Pine Tar Oil)	3	g.
Ultra-Accelerator	0.3	g.

This stock is adapted for continuous vulcanizing carried on at a high rate of speed. For example in coating No. 17 Brown and Sharpe gage drop wire with a coating 3/64-in. thick satisfactory results are obtained when the speed of travel is from 400 to 500 ft. per minute when using a vulcanizing chamber 100 ft. long. The corresponding vulcanizing periods for these speeds would be 12 to 15 seconds.

Molded Brake-Lining
U. S. Patent 1,963,511

A lining which is non-absorptive of oil or water comprises asbestos 29.7, carbon

black 7.7, barium sulphate 12.8, lead oxide 2.0, rubber 33.2, sulphur 4.6, and an aqueous suspension of a phenolic or other infusible resin 10 volume per cent.

Electrical Insulation for Cables

Satisfactory insulation is achieved by coating the cable with a vulcanized mixture of synthetic rubber 15, filler (kaolin, chalk) 40, and asphalt 45%.

Artificial Leather (Gralek)

A fabric is coated with

10% Rubber Solution in Gasoline	87½ lb.
Zinc Oxide	8 lb.
Sulphur	3 lb.
Thiuram	1½ lb.

and then with a mixture of

Rubber	100 lb.
Leather Dust	150–200 lb.
Zinc Oxide	8 lb.
Sulphur	2 lb.
Lampblack	20 lb.
Accelerator	1½ lb.
Pine Tar	5 lb.
Gasoline	1000–1200 lb.

The final coating consists of dry casein pigment, formalin 6% of dry pigment and alizarin oil 10%. Finally vulcanize and varnish.

Transmission Belt Dressing
U. S. Patent 2,001,582

Neatsfoot Oil	1 lb.
Rubber	13 lb.

Printing Blanket
Patented

Formula No. 1

A flexible and resilient printer blanket having a smooth surface which is resistant to oils and repellent to inks is made by applying a chlorinated rubber coating over the ordinary printer blanket. The coating varnish comprises chlorinated rubber (20 to 40), benzene (10 to 75), a plasticizer (3 to 10). Another varnish may contain chlorinated rubber (30), xylene (25), tricresyl phosphate (5); while in the other example there are combined chlorinated rubber (30), benzene (30), dibutyl phthalate (6). When it is desired to use pigments or dyes in the varnish it is preferred that the pigment, such as carbon black, is first mixed with the plasticizer and then incorporated in the chlorinated rubber solution.

No. 2
British Patent 423,556

In a printers' blanket of the type comprising a fibrous base and an outer coating of, or containing rubber, which is surfaced or ground in the usual manner, the outer coating is obtained directly from an aqueous dispersion of, or containing, rubber and is vulcanized to the base. The fibrous base may comprise a plurality of superposed layers of fabric material, e.g., felt, that are bonded together by a rubber cement or latex adhesive, containing vulcanizing ingredients, so that on subsequent vulcanization of the rubber coating the adhesive is also vulcanized. A preferred latex composition comprises rubber (as latex of 65.7% solids content) 100, formalin 4.65, water 79.75, potassium hydroxide 0.90, antimony sulphide 20, sulphur 6.8, whiting 75, ferric oxide 12, zinc oxide 2, sodium isopropyl naphthalene sulphonate 0.975, glue 0.375, heptaldehyde aniline condensate 1.5, acetone diphenylamine condensate 0.75 and solvent naphtha 1.5 parts; the coatings are dried at 90° C. and vulcanized at 135° C.

Mending Rubber Goods

Apply to the surface of the object a thin solution of rubber in benzol such as is used for sticking patches to auto tubes and allow a few minutes to evaporate solvent. Apply a generous coating of latex rubber and allow to stand a few hours. Can be used for mending auto tops, cuts in tires, hot water bottles, etc.

Rubber Packing Rings for Grooved Cans

In grooved containers with rubber packing rings the caps are set in place and the rings heated to 150–180° F. under pressure for about 1 sec. The formulation of the rubber ring is of importance for the proper speed of melting and the proper degree of hardness. A typical formula is (in percentages by wt.): rubber 14.10, balata 4.70, heavy spar 55.56 and chalk 25.64.

Puncture Proofing Tire Tube

A self-healing inner tube structurally designed to prevent deflation after puncturing is secured by lining the tube during its manufacture with a tread ply of rubber of special softening composition. The following formula gives satisfactory results:

Phosphoric Acid	2 lb.
Clay	1¾ lb.

Rosin Oil	3 lb.
Rubber	93¼ lb.

The particular softening agent used is ortho-phosphoric acid of 85% strength. The clay serves as a vehicle for the phosphoric acid. The clay and acid are mixed together before being added to the other ingredients. The rosin oil serves as a softener and tack producer. The ingredients are mixed on a rubber mill in the usual manner and may be calendered and slit into strips. In the construction of an inner tube by the pole or flat drum method one of these strips is used as a lining for that half of the tube toward the tread. The application of heat to the tube results in vulcanization of the body structure, but the special stock layer, due to the presence of the chemical agent and absence of sulphur, accelerator, or other vulcanizing ingredients in its composition, does not vulcanize. On the contrary it becomes extremely plastic, almost viscous in form, and interiorly is very sticky. Although the non-tacky layer in the tube causes the surface of the special stock layer to be somewhat less sticky so that it will not adhere to the opposite wall of the tube should it come in contact therewith, it is preferable that the finished tube be kept in lightly inflated condition. In the event of puncturing by a nail the sticky layer adheres to the nail so that when the nail is withdrawn, it draws back some of the sticky stock with it so as completely to seal the hole through the body structure.

Puncture Proofing Tires
German Patent 589,394

Use is made of mixtures of latex with animal, vegetable or mineral oils. A typical mixture contains ammoniacal latex 40, sesame oil 50 and olein 10%. The mixture is introduced through the air valve of the tire, distributes itself over the inner surface and automatically seals any punctures which may develop.

Gas Generating Composition for Rubber Balls

A stable mixture of ingredients from which to prepare pellets for use in inflating hollow balls, etc., follows:

Ammonium Chloride	40 lb.
Sodium Nitrite	59 lb.
Anhydrous Sodium Carbonate	1 lb.

The main constituents, viz., the ammonium chloride and the sodium nitrite, are commercial materials not completely dried. When maintained at 60° C., this gas producing mixture decomposes roughly 25 to 30 times more slowly than pellets prepared from dried materials but without sodium carbonate, and over 100 times more slowly than pellets prepared from undried commercial materials, again without sodium carbonate. They undergo no appreciable decomposition at ordinary temperatures, or is their value diminished for inflating rubber balls at 100° C. (212° F.) or over.

Rubber Vulcanization Accelerator
U. S. Patent 1,963,084

Turpentine	100 oz.
Sulphur	15 oz.

Heat at 120–130° C. for 12 hours.

Forms for Molding "Bakelite"

Graphite Powder	4 g.
Clay	4 g
Magnesia	2 g.
Cement	12 g
Asbestos Powder	1 g.
Magnesium Chloride	8 g.

Mold to a paste.

Dental Thermoplastic Molding Composition
U. S. Patent 2,020,311

Twenty-five parts of rosin are melted or fluxed with 1 to 5 parts of glycerol (depending upon the abietic acid content of the rosin), preferably under a reflux condenser, and from 10 to 25 parts of aluminum stearate added to the mixture while it is still at a relatively high temperature, that is, 250° C. or thereabove. From about 5 to 10 parts of rosin oil are then added, if desired, and after this has been thoroughly incorporated into the body, it is allowed to cool to a temperature of about 150° C., whereupon from 1 to 5 parts of triethanolamine stearate is added. Thereafter, wood flour may be incorporated. Prior to the addition of triethanolamine stearate, the composition, although elastic, is extremely sticky and gummy and unsuited for dental purposes.

Dental Impression Jelly

Agar-Agar	14 g.
Water	100 g.
Glycerin	10 minims
Kaolin	12 g.

Dissolve agar-agar in water by heating in a pressure cooker for 1½ hours. Then stir in other ingredients.

Plastic Molding Composition
U. S. Patent 1,969,146

Phenol Formaldehyde Resin	4 lb.
Charcoal, Powdered	6 lb.
Wood Flour	3 lb.
Pine Tar	½ lb.

Capsule Composition (Cheap)

Potassium Silicate (30–33° Bé.)	70 g.
Water-Soluble Dye	2 g.
Water	28 g.

Capsule Composition

Gelatin	27 g.
Water	42.7 g.

Allow to swell over night and warm gently with stirring until uniform.

Glycerin (28° Bé.)	10 g.
Water-Soluble Dye	2 g.
Water	18 g.
Preservative	

Manufacture of Casein

"Rennet Casein" suitable for making Galalith and similar plastics is best obtained as follows: To fresh skim milk at 35° C. add sufficient rennet to effect coagulation in 15–20 minutes; stir 5–10 minutes and warm to 65° C. at the rate of 1° per minute; decant twice with water at 25°; drain and press out as much water as possible, disintegrate the press cake and dry at 43–45° C.

Plastic Composition
French Patent 781,749

A composition for making pipes contains asbestos 85, fluid resin 15, lithopone 0.15, muldrite 1500 and cellulose 2200 kg. or vegetable fibers 85, resin 10 and rubber or latex or bitumen 5 kg.

Plastic Display Composition

Compositions based upon pigmented linseed oil, castor oil, and a non-alkaline thickening agent such as corn starch, have recently been suggested as constructional material for display work. They are also eminently suitable for coating theatrical drop curtains and the like. They can be produced in various colors, and of a consistency permitting easy stencilling.

For a yellow compound, 16 oz. of a paste pigment in the ratio of 6 lb. white lead to 4 lb. chrome yellow are worked up into 80 oz. of spar varnish, 10 oz. boiled linseed oil, 10 oz. Japan drier, and 2 oz. castor oil. Sufficient corn starch is then incorporated to yield a mass with the consistency of thick mortar, which is allowed to mature in the open air for about 12 hours before packing into airtight containers. Castor oil is an essential ingredient, since it assists maintenance of the solids in suspension for a very long period if the containers are air-tight.

When making up a bright red or orange composition in which the pigments accelerate drying, the above formula must be modified to the extent of using more castor oil (3 to 5 oz.), more linseed oil and less spar varnish. On the other hand, the slow-drying black compositions will require a higher proportion of varnish and japan, and as little as ½ to 1 oz. castor oil. This type of composition appears to be suitable for producing numerous figures required in industrial display work, the advantages being maintenance of flexibility and toughness after drying, good adhesion to supports and resistance to chipping.

Modeling Clay
Formula No. 1

What is called molding compound by some artists is made by mixing two parts by weight of kaolin or powdered soapstone, which must be bone dry, and one part by weight of wheat flour, stirred into three parts of melted white beeswax (not too hot), and well kneaded before the wax cools. The mass may be colored to suit. A good modeling clay can be made from dry clay, mixed with glycerin instead of water. The mixture must be thoroughly mixed.

No. 2

Plastic Clay	46 oz.
Cup Grease	24 oz.
Paraffin Wax	11 oz.
Rosin Oil	1 oz.

Polishing Plastics

Cast resins polish to a high, permanent luster. Rough cuts are usually ground, using the same type of equipment as required by wood or brass. Sand paper, garnet paper, belts or fine abrasive wheels are used. For most work, a generous supply of water is recommended, when wheels are used, to prevent overheating and to keep the wheel clean.

Surfaces which show tool or grinding marks are given a smooth surface, preparatory to final polishing, by "ashing," in which an ordinary buffing wheel, made of muslin discs, of 12 to 14 in. diameter, is used. Wet pumice, kept in a shallow pan under the wheel so that the buff just touches it, is used as a polishing agent. Often, additional wet pumice, taken from the trough, is applied by hand or trowel above the piece being worked. Polishing is usually done, on larger pieces, by a second wheel, using bar wax or specially prepared polishing compounds. These wheels, usually 12 in. in diameter, operate around 1800 r.p.m. A third, clean dry wheel is used to give a final polish.

Tumble Polishing

For large quantities of small and medium sized pieces, tumbling is often used. Here, barrels of hard wood, lined with leather or heavy felt and operating at about 50 r.p.m. are used. Solutions vary with the article being polished, a common procedure calling for preliminary tumbling in dry pumice, to which wooden shoe pegs or similar agents have been added to provide friction. The pumice is later washed off and a second tumbling follows in damp hard-wood sawdust. Other materials are sometimes used as well as pumice. A final operation consists in tumbling with powdered stearic acid or red oil. In some cases emulsions of carnauba wax are used.

PROPERTIES OF NATURAL RESINS

Natural Resins	Per cent Moisture	Direct Acid Number	Indirect Acid Number	Softening Point °C.	Melting Point °C.	Direct Acid Number After Running
Genuine Bold Pontianak	1.5	123	133	108	141	95
DBB Soluble Copal Chips	2.4	139	157	90	119	97
No. 1 Brown Kauri	5.4	57	67	120	152	35
Bold Black Scraped	1.5	20	36	125	164	17
Batu Bold Scraped	3	18	33	132	180	15
Pale Bold E. I. Singapore	0.7	20	37	128	156	9
Hard Dark Amber Congo	0.7	102	123	104	200	78
Congo Gum, Ivory Rescraped	1.8	92	111	91	144	92
Medium Pale Congo	0.4	110	132	85	220	70
Boea Medium Dark	2.9	126	149	115	148	95

Softening Point determined by the capillary tube method.

Melting Point determined by the Mercury Method-Rangaswami, reported in the Journal of the Oil and Color Chemists Asso., 1930, Vol. 13, Page 287.

CLASSIFICATION OF NATURAL RESINS

I. Low Acid Number Resins, including Damar and East India type.

A. Damar Resins—oil soluble—indirect acid number 25–45 M.P. 90–110° C.
1. Batavia
2. Sumatra
3. Pontianak
4. Padang
5. Singapore

B. East India Fossil or Semi-fossil Resins—oil soluble—indirect acid number 25–40 M.P. 125–180° C.
1. Batu
2. Hiroe
3. Rasak
4. Macassar East India
5. Bold Black Scraped
6. East Indian Singapore

II. Resins of High Acid Number originating in the East Indies:

A. Pontianak—Fossil resins—oil and spirit soluble—indirect acid number 103–140 M.P. 135–145° C.

B. Manila resins
1. Soft or Menlengket resins—spirit soluble—indirect acid number 135–160 M.P. 110–135° C. Macassar
2. Half hard or Loba resins—spirit soluble—indirect acid number 140–150 M.P. 115–120° C. Loba and Macassar Loba
3. Hard fossil resins—oil and spirit soluble—indirect acid number 105–120 M.P. 140–155° C. Boea-Loewoe-Pontianak

III. African Fossil or Semi-fossil oil soluble—indirect acid number 110–135 M.P. 140–220° C.:

A. Congo

IV. New Zealand fossil or semi-fossil resins—oil and spirit soluble—indirect acid number 55–70 M.P. 120–160° C.:

A. Kauri
B. Bush Kauri

Melting Points of Synthetic Resins

Amberol BS1	99–110° C.
Bakelite BR352	93–104° C.
Bakelite BR2072	80– 91° C.
Beckacite 1101	102–112° C.
Beckacite 1102	102–112° C.
Beckacite 1113	102–112° C.
Akco Resin, Hard	125–130° C.
Amberol F7	118–125° C.
Amberol 226	117–133° C.
Amberol 801	117–133° C.
Beckacite 1112	110–125° C.
Lewisol No. 1	120–125° C.
Paranol, Hard	115° C.
Paranol, Extra Hard	125° C.
Akco Resin, Extra Hard	140–145° C.
Amberol K-12-A	148–175° C.
Bakelite XR2963	138–150° C.
Beckacite 1100	127–142° C.
Beckacite 1106	127–142° C.
Lewisol N2	130–135° C.
Robert Rauh N2	135–145° C.
Q. D. No. 1	135–145° C.
Q. D. K.	140–150° C.

Hardening Rosin

Five hundred kilograms of rosin are melted in a kettle. Thirty-eight to 40 kg. of hydrate of lime are added at a temperature of 205° C., and the mixture is heated to 260° C. which causes the lime to dissolve and the mixture to clear up. The acid number of the hardened rosin amounts to half that of the colophony. In Germany the rosin is heated for some time at 175° C. Six per cent of calcium hydrate (produced from marblestone) with a magnesium oxide content of not more than 3% is then added. It is advisable to grind the calcium hydrate to a paste with a little linseed oil.

The English process, which is usually carried out in enamelled kettles consists of stirring 6% of calcium hydrate (marblestone material) into the rosin heated to 60–80° C., and it is claimed to be possible by energetic stirring and careful operation to raise the lime additions to as high as 10%. According to another American process, 100 kg. of colophony are heated to 232° C. Six per cent of calcium hydrate is then gradually stirred into the melt within about 15 minutes and the mixture heated to 268° C. within another 15 minutes. The opinions regarding the most efficient process are thus very different. It is important to determine the most suitable percentages of lime hydrate to be added, since working by "feel" may easily cause the production of turbid material. A rosin of an acid number 145 requires the addition of 9.8% of hydrate of lime or 10.5% of zinc white. A rosin of an acid number 180 requires 11.9% of hydrate of lime or 13% of zinc white. However, the rosin must always be heated to 175° C. before adding the lime. Hydrate of lime as well as zinc white must be absolutely dry. The lime hydrate should be freshly slaked, free from carbonic acid and finely dispersed, and it is always advisable to grind this material with a little linseed oil. Most rosins require only 6% of hydrate of lime or of zinc white (Green seal) free of carbonate. It is also possible to add both materials at the same time, as for instance, 2% of zinc white and 4% of hydrate of lime. The zinc white is added at a temperature of 220 to 240° C., the mixture boiled clear, the hydrate of lime added and the mixture heated for some time at 275° C. If the hydrate of lime contains more than 3% of magnesium oxide, the melt thickens.

According to the Haines Process, the lime rosin can be boiled directly with oil, satisfactory results being obtained with two different methods of application: The oil is either boiled with the whole of the rosin at once or only with part of it, the remainder being added later

in form of a lime rosin—benzene solution 1 : 1. The results of this process are as follows: The viscosity of the pigmented varnishes decreases if larger quantities of the rosin are boiled directly with the oil. Skinning of the pigmented varnishes decreases in the same manner. The larger the quantities of rosin directly boiled with oil the more pronounced is the whitening of the varnishes in touch with boiling water and the slower is the disappearance of the whitening. The behavior of the products towards cold water is similar. Maximum adhesion after 24 hours of storing in water is exhibited by a varnish, half of the lime rosin contents of which had been boiled with oil. This varnish also exhibits the largest pressure resistance; it is also superior in its behavior towards rapid weathering while if subjected to normal weathering conditions, the gloss of the clear varnish decreases directly with the increase of the amount of lime rosin boiled directly with oil.

The larger the quantity of lime rosin boiled with oil, the more pronounced becomes the sensibility of the product towards subsequent covering of the film with nitrocellulose lacquers.

The Koehler process for the direct boiling of lime rosin with oil is carried out as follows: The necessary quantities of rosin are disintegrated and dissolved at 80 to 100° C. in benzene (crystal oil). At a temperature of 105 to 110° C., 4 to 5% of hydrate of lime, free of carbonic acid and lumps, and suspended in benzene, is added. The kettle, or boiler, must not be filled to more than one-fourth of its capacity since the process is accompanied by strong foaming of the contents. The temperatures must not rise above 120 to 125° at the most. After foaming has subsided, the varnish can be produced at once by adding acid-poor, water-clear stand oil (with an acid number of not more than 20), tapping the mixture and centrifuging. If white enamels are produced, lime rosins must be employed which are made from excelsior rosin. One day after the production of the varnish 17 kg. of zinc white and 18 kg. of lithopone are added per 60 kg. of varnish. The mixture is thoroughly stirred and left to stand for at least 2 days. Five kilograms of varnish and 2–3% of cobalt siccative are then added and the product thinned in accordance with requirements. The subsequent addition of varnish tends to improve the gloss of the product. One to 2% of gloss-improving substances may also be added if necessary. If top grade enamel varnishes are to be produced it is advisable not to add linseed oil-stand oil alone, but also about 20% of wood oil-stand oil. However, both types of stand oil are to be boiled separately since if the two oils are boiled in common, the wood oil would thicken before the linseed oil had been boiled sufficiently.

Investigations towards improving the hardening process have led to the following formulae: 100 kg. of colophony are heated with 1 kg. of cadmium oxide to 200–250° C., stirring continuously. After complete solution, 5 kg. of hydrate of lime are added and the product left to cool down to room temperature. A very satisfactory lime rosin varnish is obtained by this process.

Another process is the following: 0.5 cc. of 33% caustic soda solution and 45 g. of paraformaldehyde are added to 100 g. of crude cresol heated to 80 to 100° C. As soon as the paraformaldehyde has been dissolved, the mixture is cooled and added to 800 g. of colophony heated to 200–250° C. The mixture is then stirred until the smell of phenol has disappeared. One hundred grams of this alcohol-soluble product is treated with 1 g. of precipitated or fused lithium resinate, the product obtained being easily soluble and free of separations.

A number of important guiding rules have to be observed in the production of glycerin-rosin esters. Esterification is almost universally effected in apparatus with reflux coolers, the operating temperature being about 250° C. The amount of glycerin added exceeds by about 3% that determined by calculation from the acid number of the resin. Esterification is complete after about 3 to 5 hours. The temperature is then increased to 300–320° C. in order to drive off the excess glycerin, the water of reaction and the volatile constituents of the resin. It is recommended to add 0.5% of boric acid which accelerates the esterification and prevents re-saponification by the water of reaction.

Investigations carried through in the State Industrial Research Laboratory at Tokyo (Japan) resulted in the following discoveries: (1) If aluminum kettles are employed, this metal appears to exert a catalytic influence on the process of esterification. (2) The acid number of the resulting rosin esters drops rapidly if operations are carried on at a temperature of 200° C. (3) Fifteen to 19% of the rosin is the most suitable glycerin contents. Higher glycerin contents tends to soften the product. (4) Excessively long heating causes darken-

ing of the product. (5) Dehydrating agents increase the speed of esterification. Suitable dehydrating agents are the hydrates, oxides and carbonates as well as the organic salts of metals, for instance, the formates of calcium and barium. Undesirable additions are boric acid and manganese borate. (6) A metallic salt addition raises the rosin ester softening temperature.

Typical and characteristic variation of the esterification process can also be observed in the various countries. In America, glycerin-rosin esters with acid numbers up to 3 are produced in aluminum kettles. "WW-rosin" is used for light colored products. After charging the kettle it is hermetically closed and the contents melted either in a vacuum or by passing through carbonic acid. Ten to 18% of glycerin (calculated on the amount of resin used) is then added and the mixture heated for some time to 205° C. and finally to 288° C. The water vapors are permitted to escape through a reflux cooler, the glycerin flowing back into the kettle. If rosin ester of an acid number of 5 to 10 is employed, about 12% of glycerin is added. It has also been found here that an excess of glycerin tends to soften the product while excessively long heating darkens the product. The varnishes produced from glycerin ester exhibit a high gloss. They are neutral in character and resistant toward basic pigments. They do not tend to crystallize, they are free of water, flow well, but are not easily mixed with drying substances, while colophony absorb them with ease. Balm and wood colophony, as well as mixtures of the two types of colophony can be esterified. The products of wood colophony are somewhat cheaper and exhibit a lower melting point. Instead of glycerin, other hydroxyl compounds, such as naphthol or benzyl alcohol, may be used, while fossil resins can be employed instead of colophony.

If, during esterizing, up to 10% of previously melted Congo or Manila copals are added, the melting points are considerably raised and the color darkened.

In Russia, rosin esters of an acid number of 4 to 5 are produced by means of catalysts, such as zinc. Rosin and zinc catalyst are jointly heated to 275 to 280° C. Eighteen per cent of glycerin is then added, the product having an acid number of 4. If catalysts are not added, it is possible by adding 24% of glycerin to obtain a product with an acid number of 25.5. A. Kogan recommends zinc chloride as zinc catalyst, while another suitable catalyst is iron trichloride in connection with hydrochloric acid gas. The original saponification number of about 173.3 is lowered by the catalytic process to about 30–40. The rosin is not appreciably changed by the use of catalysts.

According to U. S. Patent 1,771,044, it is possible even to produce rosin esters of an acid number 1 by esterizing the rosin or the resinous acid with dichlorhydrine or dibromhydrine in presence of alkalies. For instance, 75 parts of WW-colophony are dissolved in 100 parts of alcohol containing 10 parts of caustic soda. This solution is heated to 80° C. (reflux cooling) and gradually treated with 25 parts of dichlorhydrine of a boiling point of 174° C. The mixture is then boiled 15 hours (reflux cooling), the sodium chloride produced is separated and the dichlorhydrine excess distilled off. The yield consists of 70 parts of rosin ester having a melting point of 74° C. and the acid number 1.

An interesting French process provides for the use of wax alcohols. Natural colophony brands or resinates, hardened colophony or synthetic resins are made to react with wax alcohols, such as cetyl alcohol or cholesterol. For instance, 85 parts of colophony, 15 parts of lanolin and 2 parts of hydrate of lime are processed together. After heating the mixture of the first two constituents to 200° C., the hydrate of lime is added in small portions, and under continuous stirring, and this temperature maintained for some time. The product of reaction is transparent; it is soluble in the common solvents and yields varnish films of considerable plasticity and resistance. Another variation of this process provides for the heating of a mixture of 88 parts of colophony and 12 parts of cetyl alcohol or cholesterol to 200° C. with, or without, catalysts. Conditions are improved by operating under pressure or in an inert gaseous atmosphere. Or 85 parts of colophony are heated with 8 to 10 parts of glycerin and 5 to 7 parts of purified lanolin.

Esterization can be combined with the rosin production in the case of ester rosins as well as in operating with lime rosins. For instance, colophony is melted at 193° C., 24% of wood oil added and the temperature raised to 250° C. Ten per cent of glycerin is then added and the temperatures maintained at 288° C. for 6 hours. The kettle is finally removed from the fire and the glycerin rests removed by the addition of 5% of boric acid which forms volatile com-

pounds with the glycerin. The product, thinned with lacquer benzene, represents a satisfactory varnish.

Glycerin rosin ester-wood oil varnishes must be boiled and cooled down rapidly. Cooling can be effected by means of cold water or by adding cold varnish or cold linseed oil refined with alkali. Boiling with 2.5% of litharge requires the consideration of the following factors: The varnish is water resistant and impervious to gases only if boiled at 296–302° C.; the fatter the wood oil varnish, the more durable is the film, but the more pronounced is the danger of gelatinization during boiling, which can, however, be reduced by adding colophony; the lower the degree of acidity of the ester rosin or the wood oil, the greater is the danger of gelatinization and the more difficult is the addition of drying substances; the larger the ester rosin contents, the brighter and harder is the film and the more rapid is the rate of drying. Attention is called to the fact that the addition of colophony has a slightly deteriorating influence on the quality of the varnish. Addition of linseed oil, fish oil, soya bean oil, etc., lowers the water resistance of the film and reduces the speed of initial drying, but improves the gloss, the life and the elasticity of the film. Ester rosin varnishes must never be mixed with cold oil varnishes, as the components of this mixture do not combine with each other in the cold.

Increasing the Melting Point of Rosin

The melting point of rosin can be raised from 61 to 91° C. by 2 hours blowing with air in the presence of 1% cobalt oxide when molten, and to 107° C. after 6 hours. The amount of petroleum ether-insoluble substances (hydroxy acids) increased from 17.89 to 46.07%, the acid number and saponification number decreased from 159.56 to 145.26, and 170.00 to 161.29 respectively, and the esterification number increased from 10.44 to 16.03.

Purification of Rosin

The rosin is crushed, melted in a kettle, allowed to stand for 30–60 minutes, decanted from the impurities into a second kettle, boiled 1 hour with 20% of a 9° Bé. sodium chloride solution; the supernatant sodium chloride is siphoned off, and the treatment with sodium chloride repeated till a sufficiently light colored rosin is obtained. Soaps made from such rosin are lighter in color than those made from unpurified rosin.

Synthetic Resin Emulsion
U. S. Patent 1,999,715

One hundred parts, by weight, of ground resorcinol are placed in a metal container or kettle which is jacketed with an outside container, in turn equipped for steam heating and water cooling. This permits of temperature regulation during the chemical reaction as it is very essential to carefully control the temperature of the reacting substances in order to prevent their conversion to the insoluble stage. The kettle may be equipped with suitable agitators to permit the rapid churning of the kettle contents. To the resorcinol, 112 parts, by weight, of 37.5% formaldehyde solution (formalin) are added, and the temperature is increased to a maximum of 60° C., so that the resorcinol will dissolve.

In a separate container, 8 parts, by weight, of para-nitraniline are dissolved in 20 parts, by weight, of cresol having a boiling point range of from about 215 to 230° C. The melted para-nitraniline is added to the formaldehyde solution, and the mass is thoroughly agitated, the reaction temperature being raised to from 70 to about 75° C. A plasticizer of vegetable or animal oils and wax with a filler and suitable coloring material may be added as a paste to the mixture in the kettle. As an example, 8 parts, by weight, of clay, 0.8 part, by weight, of beeswax, and 1 part, by weight, of iron oxide, all best ground in a paint mill or ball mill to obtain thorough dispersion. The paste has been found to mix readily with the thickening liquid in the kettle.

For best results, the temperature should be maintained at no higher than 80° C. When the mass in the kettle becomes stringy, and before gelatinization can take place, the emulsification enhancing agent is added. A water solution (65 parts, by weight) containing 0.1% of borax is added, first slowly, and then rapidly to the agitated resin. The borax, or any other suitable alkaline salt, serves to so enhance the emulsifying action of the wax and/or the oils (and gums, if any are used) as to enable them to properly maintain the resin in suspension in the water. This results from the fact that the borax or other alkaline salt used reduces the surface tension of the water from its normal value at the operating temperatures, thereby more readily effecting a wetting of the resin particles

and enabling the wax or other fatty material used to more easily retain the resin particles in suspension. The temperature is dropped to about 20° C. and thickening of the resin takes place. A solution of alcohol (about 65 parts, by weight) or an equal quantity of a 20% benzol or toluene solution in alcohol may be added to the emulsifier to obtain proper consistency. The varnish is immediately strained to remove any foreign particles. The mass is then cooled, with accompanying increase in viscosity of the varnish, and additional alcohol or solvent mixture may be added to obtain the desired viscosity.

Flexible Synthetic Resin
U. S. Patent 1,999,097

Diethylene Glycol	106 oz.
Phthalic Anhydride	148 oz.

These ingredients are mixed together and heated gently in a suitable receptacle until all of the phthalic anhydride has melted, the temperature of the mix is then gradually raised to approximately 165° C., and maintained at this temperature for approximately 4 hours. The resulting resin on cooling is a viscous liquid having a light amber color and is soluble in acetone, alcohol, chloroform, nitrocellulose and cellulose acetate solution.

Synthetic Molding Resin
U. S. Patent 2,010,225

A mixture of 9 lb. of asbestos, 3 lb. of shellac and 2 oz. sulphanilic acid is repeatedly passed and repassed between hot rolls maintained at a temperature sufficient to keep the shellac in the composition molten. When the mixture in this manner has been rendered uniform in distribution, the resulting plastic mass may be pressed into slabs, or so-called biscuits of any desired type or shape. These biscuits may then, if desired, be subjected to a heat curing or baking process. The exact details and conditions of any such intermediate step will, to a large extent, depend upon the nature and service to which the later manufactured article is to be put. This product may then be placed in a mold either in biscuit (by softening on a steam table) or in a powdered form, and subjected to required heat and pressure necessary for forming a hard, resistant, less fusible object. Where a limited amount of agent and previous heat treatment of the biscuit material has been employed, it may be necessary to cool the mold during the pressing operation. The molding may take place in a number of ways but good results may be obtained by softening the biscuit material at 300° F., placing a slight excess in the mold and subjecting the same to 2700 lb. per sq. in. The pressure is not released until the material has cooled to a temperature sufficiently low to be readily handled without deformation.

Synthetic Resin Paper Size Emulsion
U. S. Patent 2,022,004

Resin A

Glycerol	15.6 oz.
Phthalic Anhydride	20.18 oz.
Stearic Acid	64.22 oz.

The ingredients are heated together with stirring in a suitable vessel, the temperature being carried to 200° C. over a period of 1 hour, then maintained at this point until an acid number of 47 has been reached. This requires approximately 2½ hours.

The preferred method of converting the resin into an aqueous emulsion, defined here as a dispersion of very fine particles of the resin in water, is as follows: 100 parts of Resin A at 100° C. and 61.0 parts of a 5% solution of sodium hydroxide at 60° C. are added simultaneously and in proportionate rates to 349 parts of water at 60° C., with rapid agitation during the mixing operation. The alkali solution should be added slightly in advance of the resin, and the emulsion should be stirred for a few minutes after the mixing operation has been completed. This gives a 20% emulsion of the resin. The amount of sodium hydroxide used in preparing the emulsion is insufficient to neutralize completely the titratable acid in the resin. The resin is therefore not present in the water in complete solution, but as an emulsion, i.e., it is largely in the form of a physical dispersion in the water. This is a very substantial difference from those cases in which the resin is completely neutralized, as in the prior art. The suitability of the present emulsions enables one to use resins which are carried to a lower acid number and, hence, a more complete resinification. Lower acid numbers and higher resinification are necessary to give the improved water resistance when applied for the purposes of this invention. High acid number resins require alum in addition to alkali to develop their maximum water resistance; the use of more completely esterified products obviates this disadvan-

tage. The emulsion can be diluted with warm water to any desired concentration.

Plaster of Paris Synthetic Resin Casts
British Patent 425,742

Plaster of Paris casts are impregnated with an aqueous solution of the reacting components of phenol formaldehyde resins in the early or molecular stages of condensation to increase their hardness, toughness and gloss, and to secure their impermeability to water. The product is capable of taking a high polish, and of being stained. Instead of phenol, cresol and homologues thereof may be used. In an example a plaster cast is immersed until saturated in a mixture of equal weights of commercial cresol and 40% formaldehyde and 1 or 2 parts of a 50% solution of potassium hydroxide. The solution is warmed to 35° C. The object is then stoved at 100° C.

Synthetic Dielectric Resin
Canadian Patent 342,586

Abietic acid 800, glycerol 770, phthalic anhydride 852, ethylene glycol 965 and linseed oil acids 80 parts by weight are heated under reflux to 175–180° C. for approximately 30 minutes, and 320 parts by weight of tung oil is added in 4 parts. Succinic acid (1820 parts) is added and the mass cooked until a resin is formed. The excess of glycerol is removed by vacuum distillation. The resin is used in coating compositions for fibrous material as cloth and paper in order to impart a flexible, tough film of good dielectric value, unaffected by mineral oil or petroleum or aromatic solvents.

"Albertol" Type Synthetic Resin

Formaldehyde	0.85 l.
Phenol	1 kg.
Hydrochloric Acid	0.02 kg.

Reflux 2 to 3 hours.

Pour off liquid and dry residue in vacuo at 100° C.

To 0.3 kg. of above resin add 0.7 kg. rosin and heat to 120–130° C. When solution is complete add 0.4% calcium oxide and heat to 290° C. Maintain at this temperature until a sample is soluble in oil and has an acid number of about 30.

"Haveg" or "Prodorite" Type Materials

An acid proof material suitable for tanks and other apparatus is made of 80% sand, an appropriate amount of coal or oil bitumen and of 5% acid resistant minerals (grog, clay, etc.); the mixture is heated to 150–200° F. and molded to the desired shape. It sticks to iron, is resistant to hydrochloric acid and to diluted nitric acid. Coumarone tar can be used as a protecting varnish for low temperature and for molded objects of a low mechanical strength. "Haveg" from asbestos and bauxite has a mechanical strength similar to that of cast iron.

Sound Record Composition
British Patent 408,969

A particularly suitable resin is formed by the conjoint polymerization of vinyl chloride 80 and vinyl acetate 20%. The resin may be mixed with a filler, e.g., wood filler, cotton flock, silica, mica or with a plasticizer, e.g., dibutyl phthalate, tricresyl derivative, glycol, glycerol esters.

Gramophone Record Composition

Lac	15 oz.
Copal	1.5 oz.
Silica	19 oz.
Barytes	19 oz.
Carbon Black	5.5 oz.
Scrap	40 oz.

For cheapness, part of the carbon black is often replaced by mineral black.

The scrap is spew and rejected records, etc. The amount of lac varies, dependent upon the grade used, it being generally considered that T.N. Orange is about the lowest that can conveniently be employed at present.

Vinyl Resin
Canadian Patent 352,766

Polymerize following at about 40° C.:

Vinyl Chloride	80 oz.
Vinyl Acetate	20 oz.
Hexane	100 oz.
Benzoyl Peroxide	0.5 oz.

Vinyl Acetate Resin
German Patent 615,995

Water	200 g.
Vinyl Acetate	200 g.
Hydrogen Peroxide (30%)	1 cc.
Soda Ash	1 g.

Heat at boiling point for 1 to 2 hours.

Bleaching Beewax

To

a.	Water	70–75 cc.
	Potassium Bichromate	15 g.
	Sulphuric Acid (60° Bé.)	15–20 g.
	Boil.	

add

b.	Beeswax, Molten	100 g.

Stir until color becomes greenish blue. Cool. Remove solution shortly before wax solidifies. Boil wax with clean water to remove acid.

Synthetic Beeswax

U. S. Patent 1,983,672

Formula No. 1

Five hundred grams of a mixture of the higher paraffin hydrocarbons melting at 74–76° C. (Superla wax) is mixed with 10 g. of manganese oleate and oxidized in a glass reaction vessel at 130–140° C. by oxygen passed through the hydrocarbons by means of a tube with many small orifices submerged in the hydrocarbons. The oxygen is passed through the hydrocarbons at the rate of approximately ½ cu. ft. per hour. At the end of 144 hours the contents of the vessel has gained in weight about 20 g. It has an acid value of about 23 and an ester value of approximately 100. In physical properties this product closely resembles beeswax except it melts at a temperature approximately 10 degrees above the melting point of true beeswax.

No. 2

Two batches of 1500 g. each of the ozokerite wax ("Utahwax") with a melting point of 73° C. are mixed with but 1% of their weight of manganese oleate and then oxidized simultaneously in 2 flasks A and B. Dry oxygen at the rate of 3/10 cu. ft. per hour is passed into the flask A and brought into intimate contact with the hydrocarbon therein. The oxygen and the vapors coming off from the first flask A are passed through a soda-lime tower and then into flask B. The temperature of each flask is maintained at approximately 120° C., and after oxidation for 288 hours the reaction is discontinued. The product in each flask resembles commercial beeswax and is suitable for use as a beeswax substitute. The acid value of the product in flask A is about 25.8 and its ester value about 50.6. The product in flask B has an acid value of about 46.7 and an ester value of about 56.6.

Raising Melting Point of Montan Wax

U. S. Patent 1,966,168

Formula No. 1

Crude montan wax with a melting point of 80° C. is fused. Two-tenths per cent of calcium hydroxide suspension is added to fused wax while continuously stirring, the temperature being slowly raised up to 90°. Stirring is continued at this temperature for about half an hour. In this way the melting point of the montan wax is raised to 85°.

No. 2

Crude montan wax having a melting point of 80° is fused and 0.2% of calcium hydroxide is introduced at a temperature above 100° while continuously stirring until uniform distribution has taken place. After about half an hour treatment the melting point of the wax is raised to 85°.

No. 3

Crude montan wax solution obtained in the course of manufacture is mixed with 0.2% of calcium hydroxide, care being taken that uniform distribution takes place. After the hydroxide has acted for about half an hour the melting point of the wax raised about 5°.

"Hardened" Stearic Acid Wax

Stearic Acid	75 oz.
Magnesium Oxide	5.3 oz.

Heat with stirring for ½ hour at 130–150° C. Pour at lowest possible temperature.

Illumination Candles

Paraffin (50–52° C.)	79 g.
Stearin	19.5 g.
Carnauba Wax, Bleached	1.5 g.

Wax Lighting Tapers

Paraffin Wax (40–42° C. or 42–44° C.	65–85 g.
Ceresin (58–60° C.)	30–10 g.
Beeswax	2–3 g.
Turpentine, Thickened	3–2 g.

Wick of loose cotton threads, 30 together for a size of 2–4 mm., wound on wire.

Long Burning Candles

U. S. Patent 1,954,659

Paraffin Wax	49 lb.
Hydrogenated Vegetable Oil	51 lb.

Molded Candle

U. S. Patent 1,960,994

Beeswax	70 oz.
Stearic Acid	20 oz.
Paraffin Wax	10 oz.
"Cellosolve"	1 oz.

Sealing Wax for Candle Decorations

Rosin	50 g.
Ruby Shellac	3 g.
Gypsum	1 g.

Dental Wax

Stearic Acid	1 lb.
Paraffin Scale Wax	2 lb.
Glyceryl Tristearate	1 lb.
Carnauba Wax	2 lb.
Ethylene Glycol Glyceryl Stearate	2 lb.

Ceresin Wax

Ceresin wax consists of a mixture of ozokerite and paraffin waxes.

Starting with pure yellow ozokerite and melting together in the following proportions with paraffin wax gives the following blends:

Pure Ozokerite Wax White M. P. 75° C.	Paraffin Wax M. P. 50° C.	gives Ceresin Wax
4 oz.	1 oz.	M.P. 73.5° C.
4 oz.	2 oz.	M.P. 71.7° C.
4 oz.	3 oz.	M.P. 72.5° C.
4 oz.	4 oz.	M.P. 69.7° C.

When pure white ozokerite is used the following results:

Pure Ozokerite Wax, White M.P. 75.7° C.	Paraffin Wax M.P. 58.3° C.	gives Ceresin Wax
4 oz.	1 oz.	M.P. 74.4° C.
4 oz.	2 oz.	M.P. 73.2° C.
4 oz.	3 oz.	M.P. 72.5° C.
4 oz.	4 oz.	M.P. 72.0° C.

Electrotypers' Waxes

Formula No. 1

Beeswax	5½ lb.
Paraffin Wax	3 lb.
Burgundy Pitch	¾ lb.
Rosin W.W.	½ lb.
Zinc Oxide	1½ lb.

Melt together the waxes and resins and add the zinc oxide slowly with good mixing.

No. 2

Ozokerite	63½ lb.
Beeswax	31¾ lb.
Graphite Powder	4¾ lb.

No. 3

Beeswax	85 lb.
Burgundy Pitch	5 lb.
Turpentine	10 lb.

No. 4

Ozokerite	95 lb.
Graphite Powder	5 lb.

No. 5

Ozokerite, Green	33 lb.
Paraffin Wax	50 lb.
Rosin W.W.	16 lb.
Petrolatum	⅓ lb.

No. 6

Ozokerite, Brown	90 lb.
Graphite Powder	2 lb.
Pine Pitch	8 lb.
Rosin Oil	¼ lb.

Insulating Wax

Carnauba Wax	1 lb. 14 oz.
Yellow Beeswax	4 oz.
Venice Turpentine	6 oz.
Gum Obsidian	6 oz.
Sulphur	2 lb. 8 oz.

Cook until thoroughly uniform.

This wax should have a melting point of 285° F. and a flash point of 499° F.

Recording (Phonograph) Wax

Formula No. 1

Stearic Acid 84 lb.

Melt and add slowly with stirring:

Litharge 8½ lb.

Boil off water at 220–230° F. Stirring must be of such type to prevent caking at bottom of kettle. When solution is complete add slowly (by sifting in):

Soda Ash 7 lb.

When a drop cools to a clear mass reaction is complete. Drive off all gas, froth and water by heating up to 270° F.

If a brown wax is desired add to above

Stearin Pitch 2 lb.

If a black wax is wanted add some oil-soluble nigrosine to brown formula.

No. 2

Distilled Montan Wax	60	lb.
Litharge	4½	lb.
Soda Ash	4	lb.
Paraffin Wax	30	lb.

Follow method exactly as in Formula No. 1.

Shoemakers' Sewing Wax

Candelilla Wax	2 lb.
Rosin	55 lb.
Burgundy Pitch	20 lb.
Rosin Oil	4 lb.
Lard	3 lb.
Mineral Oil (Heavy)	1 lb.

Shoe Finishers' Black Stick Wax

Candelilla Wax	9 lb.
Rosin	1 lb.
Carnauba Wax (North Country)	32 lb.
Oil-Soluble Black Dye	6 lb.
Carbon Black	¼ lb.
Paraffin Wax	1 lb.

Black Padding Wax

Carnauba Wax (North Country)	40 lb.
Ozokerite (Green)	2 lb.
Paraffin Wax	58 lb.
Rosin	2 lb.
Oil-Soluble Black Dye	7 lb.

Tree Grafting Wax

Wool Fat, Neutral	22 g.
Rosin	40 g.
Ceresin (58–60° C.)	10 g.
Beeswax	10 g.
Rosin Oil	18 g.

Wax for (Wounded) Trees

Formula No. 1

Rosin	60 g.
Alcohol	40 cc.

Melt up the rosin, add the alcohol cautiously. Stir until cold.

No. 2

Melt up:

Rosin	15 g.
Linseed Oil	2 cc.
Turpentine (Thick)	1 cc.
Yellow Beeswax	2 g.

Melt together below 78° C.

Add:

Alcohol	4–5 cc.

Fill into air-tight cans.

Non-Inflammable Film

U. S. Patent 1,981,132

Cellulose Acetate	100 lb.
Triphenyl Phosphate	20 lb.
Diethyl Phthalate	10 lb.

Transparent Foil or Film Base

British Patent 411,471

Cellulose Acetate (Anhydrous)	100	lb.
Acetone (Anhydrous)	400	lb.
Diethyl Phthalate	16.7	lb.
Diacetin	5	lb.
Triphenyl Phosphate	8.3	lb.

Polychromatic Printing Plate

U. S. Patent 1,999,549

Dextrin 10, glycerol 10, soap 10, talc 10, naphthalene 0.5 and water 16 parts are mixed with a pigment.

WAX TYPE ACIDS AND HIGHER WAX TYPE ALCOHOLS

Waxy Material	Formula	Melting Point	Specific Gravity at 15° C.	Soluble in	Occurrence
Cerotic Acid	$CH_3[CH_2]_{24}CO.OH$	77.8° C.	.836 at 79° C.	Warm Alcohol	Free in beeswax, montan wax, carnauba, also as cerotate in insect wax, wool wax, and carnauba.
Montanic Acid	$CH_3[CH_2]_{26}CO.OH$	83 ° C.	—	Methyl Alcohol	Free in montan wax.
Melissic Acid	$C_{30}H_{61}COOH$	91 ° C.	—	—	Free in beeswax and montan wax.
Stearic Acid	$CH_3[CH_2]_{16}COOH$	70.5° C.	.847	Alcohol Ether	——
Palmitic Acid	$C_{16}H_{32}O_2$	62.2° C.	.846	Alcohol Ether	As tri-palmitin in palm oil and Japan wax; as cetyl palmitate in spermaceti; as myricyl palmitate in beeswax.
Lauric Acid	$C_{12}H_{24}O_2$	43.5° C.	—	—	As laurin in coconut oil and Japan wax.
Myristic Acid	$C_{14}H_{28}O_2$	53.8° C.	—	—	As myristin in coconut and palm-nut oils.
Cetyl Alcohol	$C_{16}H_{33}OH$	50 ° C.	.810	Alcohol Ether Benzol	As cetyl palmitate in spermaceti.
Octodecyl Alcohol	$C_{18}H_{37}OH$	59 ° C.	—	—	Spermaceti.
Ceryl Alcohol	$C_{26}H_{53}OH$ $C_{27}H_{55}OH$	79 ° C.	—	Alcohol	As ceryl palmitate in opium wax, as ceryl cerate in Chinese insect wax.
Myricyl Alcohol	$C_{30}H_{62}(OH)_2$	88 ° C.	—	Ether Alcohol	As myricyl palmitate in beeswax, carnauba, sugar cane wax.
Anonymous Alcohol	$C_{24}H_{48}(OH)_2$	103 ° C.	—	Ether	Carnauba wax.
Cocceryl Alcohol	$C_{30}H_{60}(OH)_2$	103 ° C.	—	—	Cochineal wax.
Cholesterol or Cholesteryl Alcohol	$C_{27}H_{44}OH$	147 ° C.	—	— Ether	In wool-fat and sperm oil.
Iso-Cholesterol (Isomeric)	——	137 to 138° C.	—	Benzol	
Phytosterol	——	134 ° C.	—	—	Plant cholesterol.

PHYSICAL AND CHEMICAL PROPERTIES OF THE COMMON WAXES

	Sp. Gr.	Ref. Index	M.P. °C.	Setting Point	Sap. No.	Unsap. Matter %	Iodine Val.	Bromine Thermal Test	Acid Val.	Fatty Acid %	Ratio No.	Acetyl Val.	Alcohols and Hydrocarbons
Bayberry (Myrtlewax) Not a true wax	.993–.997	—	41	—	206–216	—	2.0–4.0	.2–.6	—	—	.68	—	—
Beeswax	.960–.947	1.440–75°	62–66	60–63	90–101	55.5	7.5–12.0	1.3–2.0	20	47.8	3.6–3.8	—	52–56%
Cane Sugar Wax	.980	——	58	—	80–90	69.0	88	—	12	33.3	5.7	—	—
Candelilla Wax	.972	1.456–75°	66–70	63–68	50–65	74.0	35	—	10–20	29.0	4.7 or 39	—	65–75%
Carnauba Wax	.992–.998	1.472–43°	83–84	80–87	67–88	55	12.5–15.0	1.7–2.4	2.5	48.0	31	50	54–55%
Chinese Insect Wax	.932–.970	—	81–83.5	80–81	82–93	49.5	0–1.5	0–.2	3	51.5	29.3	—	49–50%
Cotton Seed Wax	—	—	—	—	150–160	—	11–13	—	—	—	—	—	Ca 50%
Flax Seed Wax	.908	—	62–70	—	100–150	—	9–17	—	54.5	—	—	—	81.3%
Montan Wax	—	—	73–84	70–80 74–127	30–45	—	10–15 16–20	—	15–20 73–83 (Dist.)	11–15 56–64 (Dist.)	3–3.5 .03 (Dist.)	—	Ca 80%
Paraffin Wax Not a true wax	.870–.910	1.4331–1.4450	26–56 35–75	—	0–1.3	100	0	—	0	0	0	—	Ca 5%
Ozokerite Ceresin Wax	.913–.923	1.4415–1.4464	59–76	76	1.3	100	0	—	0	0	0	—	—
Japan Wax Not a true wax	.976–.993	1.4518	52–59	—	219–237	.7–15	5.0–16.0	.6–2.6	6–20	90	11–35	—	—
Raphia Palm Wax	—	—	82.0	—	—	—	—	—	—	—	—	—	—
Sperm Whale Oil: Head Oil	.879	1.459	12	—	66–76	40	86–91	14.3–15	1.5	—	—	5	39–43%
Body Oil	.876	1.462–25°	—	—	88–93	—	—	—	—	—	—	—	33–44%
Arctic Sperm Oil	.878	1.456–25°	9	—	77–79	—	—	—	—	—	—	—	—
Spermaceti	.932–.963	1.4198	41–59	—	122–134	51.5	3.0–4.0	.5–30	0.5–1.0	53.5	124– very high	—	—
Wool Wax	.945	1.480	37–41	—	101–104	—	25–43	3–4.6	12.2 50%	—	—	23	—

ADULTERANTS OF WAXES

Hardened (Hydrogenated) Oil	—	—	30–60	—	198	.5–2.0	10	—	Variable	95	25–200	—	—
Rosin	1.07–1.08	—	over 100	—	147–180	5–15	55–180	—	130–186	—	.1–0.2 [18–19]	—	—
Stearin	—	1.4380	49–56	—	200	0.5	.5–30	—	.98	96–99.5	.01	—	—

SOLUBILITY DATA OF COMMON WAXES

	Solubility in Alcohol	Solubility in Hot Acetic Anhydride	Solubility in Acetone	Solubility in Chloroform	Solubility in Ether	Solubility in Petroleum Ether	Solubility in Turpentine	Solubility in Carbon Tetrachloride	Solubility in Fusel Oil
Beeswax	76° C.	Melts, floats, dissolves—solidifies on cooling	Insoluble in cold Soluble in hot	Cold—insoluble Hot—soluble	Soluble in hot and cold	Insoluble	Soluble	Soluble	Soluble
Candellila ...	63° C.	—	—	—	—	—	—	—	—
Carnauba ...	82° C.	Becomes acetylated	Insoluble in cold Not very soluble in hot	Cold—insoluble Hot—soluble	Cold—insoluble Hot—soluble	Cold—insoluble Hot—soluble	Soluble	Soluble	Soluble
Chinese Insect Wax	Insoluble	—	—	—	—	—	—	—	—
Japan Wax ..	76° C.	Dissolves and solidifies on cooling	Insoluble in hot and cold	Soluble in cold and hot	Soluble in cold and hot	Soluble	Soluble	Soluble	Soluble
Montan	Dist. Montan Wax 70° C.	—	—	—	—	—	—	—	—
Ozokerite ...	—	Dissolves and solidifies on cooling	—	—	—	—	—	—	—
Paraffin	Insoluble	—	Insoluble in cold and slightly soluble in hot	Soluble in cold and hot	Soluble in hot and cold	Soluble	Soluble	Soluble	Soluble
Spermaceti ..	44° C.	—	Insoluble in cold and soluble in hot	Soluble in cold and hot	Soluble in hot and cold	Soluble	Soluble	Soluble	Soluble

Solvent Liquid Soaps

Formula No. 1

Linseed Oil	500 kg.
Hexalin	250–300 kg.
Potash Lye (50° Bé.)	199 kg.
Water	1208 kg.

No. 2

Linseed Oil Fatty Acids	500 kg.
Methyl Hexalin	750 kg.
Potash Lye (50° Bé.)	208 kg.
Water	292 kg.

No. 3

Coconut Oil Fatty Acids	500 kg.
1:1 Hexalin-Methyl Hexalin	250 kg.
Potash Lye (50° Bé.)	270 kg.
Water	1300–1800 kg.

The ingredients are stirred together in an indirectly steam-heated pot until a clear solution is formed; this is tested for alkalinity.

Hexalin or methyl hexalin may be partially replaced by other solvents as shown below:

No. 4

Linseed Oil	184 kg.
Hexalin	275 kg.
Potash Lye (50° Bé.)	73.5 kg.
Water	387 kg.
Carbon Tetrachloride	80 kg.

No. 5

Coconut Oil	51 kg.
Linseed Oil	42 kg.
Hexalin	130 kg.
Potash Lye (50° Bé.)	42 kg.
Water	615 kg.
Carbon Tetrachloride	120 kg.

Similarly, equal weights of benzine or high-boiling petroleum distillates may be used in place of carbon tetrachloride.

No. 6

Soap	35 kg.
Cyclohexanol	10 kg.
Water	55 kg.

No. 7

Soap	28 kg.
Trichloroethylene	10 kg.
Water	60 kg.
Potassium Carbonate	2 kg.

No. 8

Soap	30 kg.
Trichloroethylene	25 kg.
Water	45 kg.

No. 9

Soap	5 kg.
Ammonia (0.880)	25 kg.
Cyclohexanol	10 kg.
Water	60 kg.

No. 10

Soap	10 kg.
Ammonia (0.880)	5 kg.
Tetralin	10 kg.
Water	75 kg.

Other liquid soaps can be made according to the following formulae:

Formula	No. 11	No. 12	No. 13	
Coconut Oil	21	—	6	kg.
Soya Bean Oil	—	8	12	kg.
Potassium Hydroxide Solution (50%)	9.5	4.6	9.6	kg.
Sugar	12	8	—	kg.
Borax	2	—	—	kg.
Glycerin	—	6	12	kg.
Potassium Carbonate	—	2	—	kg.
Water	55.5	71.4	60.2	kg.
Oil of Lavender	—	—	0.1	kg.
Linalyl Acetate	—	—	0.1	kg.

The oil is first run into a pan fitted with an open steam coil which serves to both heat and agitate the pan contents. Heat the oil to about 70° C. and gradually add the caustic potash solution until the oil is completely saponified.

It will be found necessary to add water before all the alkali has been introduced. This is one method of checking foaming which is likely to occur particularly in the case of cotton-seed oil and to a lesser extent when coconut or palm kernel oil is used. When saponification is complete add sugar, glycerin, etc., and finally adjust the water content. Allow to cool somewhat, then add color and perfume if required.

Where possible it is an advantage to use soft water, as salts of hard water result in the formation of corresponding insoluble metallic soaps, which deposit or give a cloudiness in solution.

Liquid Soap Shampoos

Liquid soap shampoos are best made from olive oil potash soap dissolved in hot 80% alcohol in which it is completely

soluble, although the solution becomes slightly clouded on cooling. Dissolve the soap (1 part) in alcohol (4 parts) in a vessel which can be heated on a water bath and so constructed that alcohol is not lost by volatilization. When completely dissolved add coloring matter and perfume.

The formulae given are only a very few of the many that are available. Even using the same constituents of a given formula, the number of combinations could be varied in relation to fatty acid content, etc. Obviously the relative percentages of oil and alkali required for saponification would vary only between narrow limits.

Production of Liquid High-Content Potassium Soaps

German Patent 613,224

Formula No. 1

a.	Olein	350 g.
	Coconut Oil Fatty Acid, (free from Stearic Acid) Distilled	50 g.
	Alcohol	150 cc.
b.	Water	210 cc.
	Potassium Acetate	50 g.
	Caustic Potash (48° Bé.)	190 cc.

Mix the two solutions. Soap contains 40% free fatty acid, is liquid down to 0° C. and gives no jelly on standing.

No. 2

a.	Fatty Acid of Low-Boiling Fraction of Sperm (Whale) Oil	1000 g.
	Cocoanut Oil Fatty Acid (Low Titre) Distilled	220 g.
b.	Adipic Acid	75 g.
	Alcohol	450 cc.
c.	Caustic Potash (48° Bé.)	630 cc.
	Water	700 cc.

Mix *a* and *b*, and add *c*, with stirring. Clear, liquid soap with 40% free fatty acid.

Liquid Soap (15%)

Coconut Oil	12 kg.
Castor Oil	4 kg.
Potassium Hydroxide (50° Bé.)	8 kg.
Water	76 kg.
Potassium Chloride	0.5 kg.

Saponify with warming; allow to stand for 1–2 weeks, separate clear liquid by siphon, filter sludge through a Seitz filter, put both together; optionally use alcohol or glycerin.

Liquid Olive Oil Soap

Two hundred and twenty-seven kilograms of potash are dissolved in the minimum quantity of water, and into the solution is stirred a mixture of 182 kg. olive oil, 362 kg. palm oil and as much coconut oil previously warmed to 49° C. Alcohol is next run in (170 l.) and the liquid heated to 82° C. (under reflux it is presumed). After saponification and cooling, 5.6 l. water are run into the alcoholic soap.

Liquid Coconut Oil Soap

Six kilograms potash are dissolved in 20 l. water and the solution run into 20 kg. coconut oil warmed to 49° C. After adding 2.5 l. of alcohol the mixture is kept at 82° C. to saponify, when it is left to cool for 24 hours. Eighty liters of water are then added, with a little sugar, potassium chloride or glycerin if necessary.

Glycerin Liquid Soap

Thirty-five parts of good soft soap are well mixed with 21 parts glycerin, and 7 parts of water well crutched in. This is followed by 14 parts alcohol. This solution is subjected to a fairly long sedimentation after adding talc or pumice. If excessively alkaline it must be first corrected by the addition of oleic acid. Perfuming or coloring can be done if desired.

Liquid Soaps

Coconut Oil	10 kg.
Castor Oil	5 kg.
Lard Oil	2 kg.
Caustic Potash (3½ parts solid)	16½ kg.
Water	to suit

This should be easy to make. Warm up the mixed oils and add the caustic solution. Heat gently. When clear and bright, like syrup, add sufficient distilled water to the consistency required, using phenolphthalein solution (½%) to correct.

Another mixing that will not lather as readily as the previous one, but which has the advantage of being an excellent cleanser, the power of which is only slightly diminished even in hard water, is as follows:

Lard Oil, Olein or Castor Oil	50 kg.
Glycerin	150 kg.
Caustic Potash Solution (38° Bé.)	20 kg.
Carbonate of Potash Dissolved in 5 parts of Hot Water	3 kg.

This can be perfumed slightly and the following should give a delicate, yet pleasing, result:

Lavender Oil	2 kg.
Bergamot Oil	1 kg.
Geranium Oil	1 kg.
Patchouli Oil	¼ kg.

About 1% of this should be sufficient to give the desired effect. The nethod of making the above soap should follow along the lines described and should present no difficulty.

Formaldehyde Soap Solution

Soft Soap	40 lb.
Alcohol	30 lb.
Formaldehyde	20 lb.
Distilled Water to make	100 lb.

As to perfume, oil of lavender (about 1 lb.) may be added.

Liquid Disinfecting Soap

a.	Coconut Oil	18 kg.
	Soya Oil	2 kg.
b.	Caustic Potash (38° Bé.)	12 kg.
c.	Water, Soft	68 kg.
	Potassium Chloride	0.5 kg.

Mix *a*, saponify with *b*, dissolve in *c*. Prepare:

d.	Turkey Red Oil (70%)	3 kg.
	Phenyl-p-Hydroxy-Benzoate	20–25 dg.

The solution *d* is enough for 100 kg. of above made soap-base.

Add perfume.

Disinfectant Scrub Soaps

Cheap disinfectant soaps in England ordinarily consist of suitable tar acid derivatives emulsified in a solution of rosin soap. Creosote, phenols, cresols and naphthalene are the usual disinfectant agents. The following directions are for the preparation of liquid disinfectant soaps suitable for scrubbing floors, etc.:

Formula No. 1

Ground Rosin	17 lb.
Caustic Soda, 30%	3 lb.
Water	5 gal.
Crude Cresol	3 gal.

Boil the caustic soda in 1 gal. of water and add the rosin gradually to this. When dissolved and partly saponified, add 2 more gal. of water with continuous boiling and stirring. Add 2 gal. of cresol with stirring, then the remainder of the water and cresol. Keep covered until cold.

No. 2

Water	6½ lb.
Powdered Rosin	3¾ lb.
Powdered Soda Ash	1 lb.
Powdered Naphthalene	¾ lb.
Filtered Creosote	½ lb.
Soft Soap	¼ lb.

Dissolve the soda ash in water and heat to boiling. Add the rosin and heat until saponified. Mix the soft soap and naphthalene separately and add the creosote to this. Add the mixture to the rosin soap with continuous stirring.

Pine Oil Scrubbing Soap

Corn Oil Soap	50 lb.
Pine Oil	10 lb.
Diglycol Laurate	5 lb.
Alcohol	3–5 lb.

Mix until uniform. A transparent jelly like product is formed.

Liquid Pine Oil Soap

Formula No. 1

Pine Oil	300 kg.
Soya Oil Fatty Acid	100 kg.
Water	60 kg.

Warmed gently to be liquefied, then add

Caustic Potash (50° Bé.) 40 kg.

Clear Soap Oil, 1 part mixes with

Turpentine	4 parts
or	
Benzoline	4 parts
or	
Carbon Tetrachloride	4 parts
or	
Dichloro-Ethylene	4 parts
or	
Naphtha	4 parts

to clear oils, which give excellent emulsions in water (1:1 to 1:2).

Above made Pine Oil Soap	12.5 kg.
Pine Oil	12.5 kg.
Spindle Oil, Refined, 2° Engler, at 50° C.	75 kg.

yields clear oil, gives excellent emulsions with water.

No. 2

Melt

Rosin WW–F/G	15 kg.
Soya Oil Fatty Acid	30 kg.

Add

Pine Oil	105 kg.

Take off 40 kg. and keep aside. To the remaining 110 kg. add:

Water	135 kg.
Caustic Potash (50° Bé.)	15 kg.

Stir until glassy-transparent, add the above mentioned 40 kg.

To the product add

Water	less than 300 kg.
(a tough, jelly like soap paste)	
or Pine Oil	100 kg.
(water soluble, liquid soap)	

No. 3

Pine Oil Jelly Soap

Soya Oil Fatty Acid or Linseed Oil Fatty Acid	40 kg.
Pine Oil	25 kg.

Warm gently.
Add:

Water	15 kg.
Caustic Potash (50° Bé.)	8 kg.
Caustic Soda (36° Bé.)	12 kg.
Water (optional)	15–30 kg.

No. 4

Pine Oil, "Soluble"

Soya Oil Fatty Acid or Linseed Oil Fatty Acid	25 kg.
Pine Oil	35 kg.

Warm gently in

Water	10 kg.
Caustic Potash (50° Bé.)	10 kg.
Pine Oil	160 kg.

Pine Oil Cleaning Paste

Glycol Laurate	5 lb.
Pine Oil	25 lb.

Mix and add to fo lowing while stirring vigorously

Water	50 lb.
Caustic Soda	¼ lb.

Soap Paste Paint Cleaner

Soap Chips	20 oz.
Mineral Spirits	10 oz.
Water	69.3 oz.
Oil of Sassafras	0.7 oz.

This is a semi-solid or heavy soap paste, white and permanent. It is very effective as a cleaner for painted surfaces. It is also used as a cleaner for carpets and rugs. The soap is allowed to soak in the water which is then heated to bring all the soap into solution. Same is then agitated vigorously while the mineral spirits is added and then the oil of sassafras.

Waterless Soap

Oleic Acid	4 lb.
Turpentine Substitute	1 lb.
Industrial Spirit	2 lb.
Castor Oil	1 lb.

Neutralized with a solution of caustic potash (1:1), 2 of water added to form a paste and 15% of powdered borax incorporated.

Soap Powders

Formula No. 1

Palm Kernel / Coconut } Oil Fatty Acid	3 lb.
or	
Tallow / Hard Fat / Bone Fat / Palm Oil (Bleached) } Fatty Acid	2 lb.
Caustic Soda (36° Bé.)	3 lb.
Soda Ash	12 lb.

No. 2

Soft Soap Fatty Acids	6–7 lb.
Hard Soap Fatty Acids (as above)	4–3 lb.
Caustic Soda (37° Bé.)	6 lb.
Water	50 lb.
Soda Ash	36 lb.

No. 3

Soft Soap Fatty Acids	12–15 lb.
Hard Soap Fatty Acids	8–5 lb.
Caustic Soda (37° Bé.)	12 lb.
Water Glass (36–38° Bé.)	6 lb.
Soda Ash	30 lb.
Water	32 lb.

No. 4

Soft Soap Fatty Acids	18 lb.
Hard Soap Fatty Acids (as above)	7 lb.
Caustic Soda (37° Bé.)	15 lb.
Water Glass (36–38° Bé.)	8 lb.
Soda Ash	25 lb.
Water	27 lb.

Soap Flakes

To make high-grade soap flakes, a good quality charge consisting of 75% tallow and 25% coconut oil, with or without the addition of 2% or less of rosin, should be used. The mixture should be boiled and finished as for toilet soap, then chipped and dried. Care must be taken in drying in order to produce a uniform chip and avoid overdrying. The temperature of the soap chips should never fall below 30° C.; the temperature of the finished flakes should be between 40 and 45° C. The flakes should be milled twice to give transparency and polish. The most satisfactory shape to avoid breakage of very thin flakes is the square.

Soap for "Soap Noodles"

Coconut or Palm Kernel Oil	28 g.
Tallow or Hard Fat	4 g.
Caustic Soda (38° Bé.)	10 g.

Potassium Carbonate (30° Bé.)	10 g.
Water	10 g.
Salt Solution (24° Bé.)	10 g.
Sugar Solution (24° Bé.)	10 g.

Borax Soaps

Soap from Kettle	1000 lb.
Powdered Borax	130 lb.
Lye (40% Caustic Soda)	23 lb.
Perfume, etc.	sufficient

The soap is run into the crutcher, the borax, etc., added, and the whole crutched until the materials are thoroughly mixed. The physical condition of the soap is of less importance than when the soap has to cool in the frames and, therefore, the incorporation of larger quantities of borax becomes feasible.

Various methods are available for the manufacture of soap powders, fillers being introduced before or after the soap is converted into powder. In the former case spoken of as the "continuous" process, the soda ash used takes up the excess water present with the soap, forming hydrated carbonate of soda and thus obviates the necessity of drying. A soap powder of this type suitable for laundry and general purposes can be obtained from the following formula:

Borax Soap Powder

Soap	42 lb.
Soda Ash	42 lb.
Powdered Borax	15 lb.
Salt	1 lb.

The soap is run hot from the kettle into the crutcher, and after thoroughly mixing with the soda ash and the borax, it is run over chilling rolls to chill the soap and crystallize the salts. The product is scraped off the rolls, the coarser particles being ground further. Alternatively, the mixture, after leaving the crutcher, is allowed to season for a few days, after which it is ready for powdering and packing.

Washing Powder

Fatty Acids	27.7–45.4 kg.
Sodium Perborate	4.8–13.5 kg.
Soda Ash	17.1–23.2 kg.
Water Glass (Dry Basis)	0.6– 2.4 kg.

Abrasive Washing Powder

Soap	5 –10.2 kg.
Sodium Carbonate	5.6–10 kg.
Sand	73.7–81.5 kg.

Washing Powder

Formula No. 1

Cut into small pieces	
Hard Soap Waste	10 kg.
Dissolve in	
Water	46 kg.
Add	
Water Glass	10 kg.
Sodium Carbonate, Calcined	39 kg.

Mix well to obtain homogeneous mass.

No. 2

Hard Soap Waste	20 kg.
Water	41 kg.
Water Glass	9 kg.
Sodium Carbonate, Calcined	35 kg.

No. 3

Hard Soap Waste	40 kg.
Water	38 kg.
Water Glass	4 kg.
Sodium Carbonate, Calcined	35 kg.

to get a 20% powder.

Note: the sodium carbonate is added only partially to the formulas 1, 2, 3, ⅔ is put on the bottom of the mixer before starting. Blow air into the warm mixture. Let cool for 24 hours.

Ammonia Washing Powder

Hard Soap Powder (Alkaline)	1 lb.
Ammonium Carbonate	1 lb.

Household Scourer

Colloidal Clay	1 lb.
Silica Floss	1 lb.
Alkaline Hard Soap Powder	4 lb.
Silicate or Carbonate of Soda	1 lb.

Fermentative Washing Powder

Sodium Carbonate	75 g.
Bile, Precipitated on Kieselguhr	25 g.

100 g. of this powder are applied to 50 kg. laundry batch.

Cold Processed Soap

British Patent 403,500

A method for preparing "cold processed soap" is to stir a mixture of 170 lb. of palm kernel oil with 9 gal. of 36° Bé. caustic soda solution. In a separate container, 6.5 gal. of a mixture containing equal parts of palm kernel oil and rosin is heated to 250° F., cooled to 110° F., and quickly added to the first mixture. After stirring for 10 seconds, the soap is run out through a valve in the bottom of the mixing pan, and subsequently treated in the usual manner.

Addition of rosin makes a more satisfactory and standard product than is usually obtained by cold process methods.

Cold-Process Carbolic Soap

For toilet purposes a cold or semi-boiled soap is used, which retains the glycerin liberated from the fat. The following is a typical formula:

Formula No. 1

Coconut Oil	80 lb.
Tallow	40 lb.
Soda Lye (38° Bé.)	60 lb.
Phenol	3 lb.

The fat and lye are thoroughly stirred at 35° C. until combination occurs and the soap is streaky. The phenol (dissolved in a little water) is crutched well into the soap; perfuming is sometimes done with a little clove, lavender or rosemary oil. When cold the soap is cut into tablets and wrapped in air-tight package.

No. 2

Bone Fat	150 lb.
Rosin	150 lb.
Carbolic Acid Solutior	25 lb.
Caustic Soda Lye (37° Bé.)	150 lb.

The rosin and fat are melted together, and when the temperature is about 75° C. the carbolic acid is stirred in. The mixture is then added to the lye gradually, heating until the reaction is complete. The soap is framed and cooled and cut into bars of the usual size.

Cold Process Soap
British Patent 432,227

Cold-process fat-resin soaps are made by treating fatty matter with just sufficient alkali for saponification, treating a mixture of rosin and fat or oil with alkali sufficient to saponify only the rosin, mixing the two products, and adding alkali to saponify the surplus fat. For example, 100 lb. of palm-kernel oil is stirred rapidly with 4.5 gal. of 36° Bé. caustic soda for 10–15 minutes, 4 gal. of a melt of rosin in an equal weight of palm-kernel oil is treated at 110–135° F. with 0.5 gal. of 36° Bé. caustic soda, the products are mixed, and immediately 1 gal. of 36° Bé. caustic soda is added, and the mixture stirred for a few seconds and run quickly into the frames, where it sets and saponification is completed.

Dry Cleaner's Soap
British Patent 407,088

Soaps for use with dry-cleaning solvents, especially carbon tetrachloride or trichloroethylene, consist of a fatty acid soap with a content of a polyglycol, with or without a chlorinated aliphatic hydrocarbon. An illustration is the following: 14.2 g. of sodium hydroxide is dissolved in 25 cc. of water and stirred into 100 g. of oleic acid and 100 cc. of trichloroethylene. Next 70 g. of triethylene glycol or 50 cc. of diethylene glycol is added. The product is dissolved in trichloroethylene.

Soaps Containing Pine Oil
German Patent 616,029

Formula No. 1

a.	Pine Oil	100 g.
	Caustic Potash	12.5 g.
b.	Coconut Oil Fatty Acids	18–25 g.

Treat *a* at 80–100° C., neutralize the product with *b*.

No. 2

a.	Pine Oil	100 g.
	Caustic Soda (95%)	4 g.
b.	Fatty Acid	19 g.

As in No. 1. Solid, water-free soaps, high transparency.

Solid Pine Oil Soap
U. S. Patent 2,007,974

Take one part water and two parts olive oil soap containing about 10% of water in the condition of flake or powder and when those are well blended stir in about one or two parts of pine oil. The vessel containing the mixture is placed in a kettle surrounded by glycerin and the temperature of the soap, water and oil is gradually raised to about 240° F. by heating the outer kettle. Steam is given off causing frothing of the soap with a great increase in volume of the mass. While some oils ordinarily begin to volatilize below this temperature, the soap raises the boiling point and permits them to be completely merged and held. When the heat, frothing and stirring have secured a uniform mixture, the mass is permitted to cool and solidify.

The solid soap lathers well, but slowly and yields at all dilutions a perfectly incorporated oil. It has the pleasant odor of pine oil but has the firm feel of anhydrous soap. The well fixed character of the oil is proved by the fact that the soap does not render white paper greasy after long contact with it.

Medicated Soaps

These types of soap can be made in two ways, either milled or by the cold process; as to their efficiency for the purpose for which they are intended, opinions differ, some claiming that they are of no value, others that certain complaints can only be cured by their use. Certainly much can be said for the latter statement, particularly when the complaint is in the nature of a skin disease such as eczema, and even without the addition of a specific body, toilet soaps which are superfatted with bodies such as lanolin or petroleum jelly naturally have a beneficial action on the skin.

No compound in skin soaps can compare with the well-known ichthyol variety. This compound can either be incorporated with flowers of sulphur and camphor or it may be used alone. Two mixings are given below containing these bodies.

The first examples given are of the milled variety, which is certainly the best form of tablet both from appearance and as giving a perfect blend of the various bodies.

Ichthyol and Sulphur

Soap Chips	28	lb.
Ichthyol	4½	oz.
Vaseline	2	oz.
Zinc Oxide	2	oz.
Flowers of Sulphur	2	oz.
Chlorophyll	1½	oz.
Medicated Perfume	4	oz.

Ichthyol

Soap Chips	28	lb.
Ichthyol	7	oz.
Vaseline	2	oz.
Medicated Perfume	4	oz.
Zinc Oxide	2	oz.
Chlorophyll	1½	oz.

The antiseptic value of the tablets is enhanced by the use of the medicated perfume, which gives the type of odor used in a well-known line on the market, having a ready sale as a medicated toilet soap.

Medicated Perfume

Eucalyptus Oil	18	cc.
Terpineol	18	cc.
French Lavender Spike Oil	18	cc.
Red Thyme Oil	8	cc.
Clove Oil	8	cc.
Peru Balsam	6	cc.
Camphor	3	g.

The soap and additions are milled in the ordinary way; it may be found necessary to mill more than the usual three times on account of the liquid nature of the additions. This may be obviated somewhat by using the soap chips a little drier than the usual 76–77% fatty acids—say about 78–79%.

The chlorophyll used is the oil-soluble type, dissolved in a little medicinal paraffin, or if this is not available the perfume may be warmed slightly and used as medium.

All other kinds of medicated milled soaps can be made on the foregoing principle, leaving out the ichthyol, etc., and adding whatever is needed; the percentage used varies from 2½ to 5, the lower figure being more general.

The other variety is the well-known cold process soap, a very fine preparation for the feet. This soap, owing to the ease with which it is made, is one for the small manufacturer with his limited plant. It contains permanganate of potash, and the directions for its use are: Wash the feet and allow the lather to remain in contact with the skin a minute or so before rinsing. The instructions for its manufacture are as follows: Melt the tallow and coconut oil together, and at 120° F. pour in the caustic soda in a thin stream, stirring all the time; add the perfume and then the water, keeping the mass continuously on the move. When the soap is of the consistency of cream, which should be only about 3 to 4 minutes from the start, pour into a wooden frame and just crutch the permanganate solution here and there in the mass; *do not* thoroughly mix it in. The appearance obtained is similar to marble graining. After standing 45 hours, covered and free from draughts, the block of soap is ready for cutting, the size of tablets being usually 4 oz.

The mixing for the above soap is:

Tallow	80	lb.
Coconut Oil	80	lb.
Caustic Soda, 66° Twaddell	80	lb.
Water	28	lb.
Perfume	1	lb.
Permanganate of Potash in 1000 cc. Water	¼	lb.

Perfume

Pine Oil	1	cc.
Cassia Oil	¼	cc.
Lavender Spike Oil	½	cc.
Patchouli Oil	½	cc.
Ditolyl Methane	½	cc.

Another soap made as above, leaving out the permanganate and using in its place stavesacre seed oil with a different perfume, is also sold for the removal of head vermin in children, and may be included in the list of medicated soaps.

Perfume

Sassafras Oil	5 cc.
Geranium Oil	1 cc.
Sandalwood Oil W.I.	2 cc.
Terpineol	5 cc.

The active principles of the last-named soap are the stavesacre seed oil and the sassafras oil—a very effective combination. These few examples embrace the whole range of medicated soaps, the only alteration in other cases being the medicating substance, the percentage of which, as mentioned before, ranges between 2½ and 5.

Antiseptic Soaps

An odorless phenolated soap can be made by mixing in about 3% of a fatty acid phenol ester such as phenyl stearate, palminate or oleate. These esters are non-irritant to the skin and stable to alkalies. Iodine has been used in soaps. It does not have a very active antiseptic action when in the form of its compounds and is therefore employed as a solution in alcohol or in potassium iodide. Iodide is not stable however, as may be seen from the fact that soaps containing it change from brown to a light yellow in a short time. A better way of introducing iodine into soap is to add it in the form of a compound with an unsaturated acid such as oleic. A large number of so-called iodine soaps are made with potassium iodide and are quite stable, although they are not really iodine soaps.

Sulphur is a useful therapeutic for certain skin troubles. Its action is due to a mild antiseptic effect combined with reducing properties. Sublimed sulphur is generally used. The difficulty of getting sulphur into the water-soluble form may be overcome by using a combination of certain terpenes with alkaline sulphides and polysulphides. The solution of the clear brownish liquid in water gives a white emulsion with a slight alkaline reaction. It is non-irritant. A tar-sulphur soap is widely sold for the treatment of a variety of skin diseases. It is a brown soap prepared by dissolving 2 lb. of potassium sulphide in a small amount of water, and adding 20 lb. of yellow stock soap together with 4 lb. of birch tar oil. The mass is milled several times.

The manufacture of soap incorporating mercury or corrosive sublimate is not an easy matter. The mercury salt reacts rapidly with the soap to form complex insoluble compounds. An improved process for incorporating mercury makes the soap contain an excess of free fatty acid, which prevents the chloride from reacting with the soap. In another process, the mercury salt is mixed with an alkaline casein solution, forming a mercury albuminate soluble in alkali.

Mercuric iodide is used in some soaps. It is best added by mixing 4 parts of mercuric iodide with 3 parts of potassium iodide and 2 parts of water, then incorporating the precipitated salt with the milled soap. The method of using nonionized complex mercury compounds is one that shows promise. These compounds give no black precipitate on addition of ammonium sulphide in the cold. Those which give no precipitate on prolonged standing are the best suited for the purpose.

Germicidal and Antiseptic Soap

Coconut Oil Soap Base	50 g.
Cresol U.S.P.	5 g.
Mercuric Chloride 1–2000 Solution)	45 g.

Iodine, Ichthyol, Camphor Soaps

Formula No. 1

Soap Base

Coconut Oil Ceylon	25 kg.
Caustic Soda (38° Bé.)	10 kg.
Caustic Potash (38° Bé.)	2 kg.
Lanolin	1 kg.
Camphor	2 kg.

No. 2

Iodine Soap

Same, but add

Potassium Iodide	1–1.5 kg.
in Water, Hot	2 kg.

No. 3

Ichthyol Soap

Same as No. 1, but add

Ichthyol or Ammonium Ichthyolsulphate	1–1.5 kg.

Perfume

Peruvian Balsam	120 g.
Lavender Oil	100 g.
Cassia Oil	100 g.
Benzoin, Tincture	200 g.

Perfume only for No. 2 or No. 3.

Boric Acid Soap

Sapamin-Phosphate (100%)	10 oz.
Boric Acid	5 oz.
Glycerin	5 oz.
Distilled Water	20 oz.
Triethanolamine Laurylsulphonate	60 oz.

Sand Soap

Coconut or Palm Kernel Oil	20	kg.
Caustic Soda (38° Bé.)	11	kg.
Pumice, Finely Powdered	10	kg.
Solution of Benzoline, Tetralin Turpentine Oil in Turkey Red Oil (1:1)	8	kg.
Perfume	0.5	%

Mixture of

Lavender Spike Oil	5	cc.
Rosemary Oil	4	cc.
Peppermint Oil	1	cc.
Caraway Seed Oil	1	cc.

Washing Tablets

Formula No. 1

Perborate of Soda	32	oz.
Granulated Borax	35	oz.

No. 2

Perborate of Soda	35	oz.
Borax	17.5	oz.

No. 3

Perborate of Soda	27	oz.
Borax	58	oz.

No. 4

Perborate of Soda	4	oz.
Borax	12	oz.

No. 5

Perborate of Soda	34	oz.
Borax	18	oz.
Soda Ash	22	oz.

In each of above formulas make up to 100 with soap. Crutch with soap; cut into squares and dry.

Wool Throwers Soap

Olive Oil Foots	12	lb.
Corn Oil	46	lb.
House Grease	20	lb.
Soda Lye, 36° Bé.	3	lb.
Potassium Carbonate (Dry)	5¾	lb.
Potassium Hydrate (Solid)	23	lb.

Borax Laundry Soap

Finished Soap	1100	lb.
Soda Ash	15	lb.
Solution of Carbonate of Soda (30%)	25	lb.
Solution of Metaborate of Soda (s.g. 1·6)	25	lb.
Silicate of Soda (40° Bé.)	85	lb.
Soap Stock	40	lb.

The nature and proportions of the fats and oils are important. In a general way the oils cottonseed, coconut, and palm-kernel, particularly the last two mentioned, take up and hold fillers better than tallow and hardened oils. The presence of rosin also assists. The proportion of coconut oil is increased when the soap is required to lather freely.

Wool Scouring Bath

Olive Oil Soap	40	lb.
Ammonia 28%	20	lb.

Transparent Glycerin Soaps

Formula No. 1

a. Prepare a solution

Caustic Soda (40° Bé.)	20	g.
Alcohol (90–92%)	14	g.
Sugar	10	g.
Water	11	g.
Glycerin	11	g.

Warm to 60–70° C.

b. Add first melted

Stearin, White	10	g.

then

Coconut Oil	18	g.
Tallow, White	12	g.
Castor Oil	4	g.

No. 2

a.	Caustic Soda (35° Bé.)	22	g.
	Alcohol	20	g.
	Glycerin	20	g.
	Sugar	10	g.
	Water	10	g.

Warm to 60–70° C.

b.	Stearin	12	g.
	Coconut Oil	20	g.
	Castor Oil	5	g.

No. 3

English Transparent Soap

a.	Caustic Soda (38° Bé.)	50	g.
	Alcohol (90–95%)	50	g.
	Sugar	17.5	g.
	Water, 60° C.	23	g.
b.	Pig Fat or Tallow	37.5	g.
	Rosin, Pale	12.5	g.
	Coconut Oil	50	g.

Filled (Cheap) Transparent Soaps

		Formula No. 1	No. 2	
a.	Caustic Soda (38° Bé.)	77	48	g.
	Sugar	21	—	g.
	Water	36	—	cc.
	Filling Solution *	90	50	cc.
	Alcohol	12	20	g.
b.	Coconut Oil	53.5	40	g.
	Pig Fat or Tallow	53.5	40	g.
	Castor Oil	42	20	g.

* Filling Solution,

Water, boiled	300 cc.	200
Sugar	51 g.	70
Potassium Carbonate	52 g.	60
Salt	52 g.	40

Transparent Soap

Hard Train Oil Fatty Acid	40 kg.
Soya Bean Oil Fatty Acid	60 kg.
Caustic Potash (50° Bé.)	42 kg.
Potassium Carbonate	13 kg.
Water	75 kg.

Filled Soap

a.	Palm Kernel Oil	200 g.
	Tallow	100 g.
	Bone Fat	100 g.
b.	Water Glass	80 g.
c.	Talc	60 g.
	Water	60 cc.
d.	Caustic Soda (25° Bé.)	370 cc.

Melt up *a*, keeping extra 20 of the palm kernel oil. Add *b* molten into kettle to *d*, and boil to right consistency. Add *c* as water-suspension. Now add salt water (23–24° Bé.) 8–10 cc., boil, test. If soap is too "sharp," add the remainder of the palm kernel oil until right. When tests show satisfactory results, boil 2 more hours and cool in covered kettle.

Soap Perfume

Cinnamic Alcohol	100 g.
Neroli	50 g.
Petitgrain (Grasse)	50 g.
Orangeflower Absolute	10 g.
Hydrarom Fleur d'Orange	5 g.
Rose Otto (Bulgarian)	15 g.
Orris Concrete	5 g.
Costus (10%)	20 g.
Sandalwood, E.I.	80 g.
Bergamot	180 g.
Musk Ketone	40 g.
Musk Ambrette	20 g.
Coumarin	60 g.
Vetiverol	70 g.
Heliotropin	85 g.
Rhodinol, Pure	50 g.
Methylionone, Pure	60 g.
Benzoin Resinoid	60 g.
Phenylacetaldehyde (50%)	40 g.

Automobile Tar Solvent

Naphtha	40 oz.
Ethylene Dichloride	90 oz.
Diglycol Laurate	5 oz.

Automobile Cleaner

Diglycol Laurate	10 fl. oz.
Kerosene	2 pt.
Naphtha	1 pt.
Water	6 pt.
Kieselguhr	1–2 lb.

Bleaching Soda

a.	Water Glass, Commercial (36–38° Bé.)	30 g.
b.	Water	25 g.
c.	Ammonium Carbonate	45 g.

Dilute *a* with *b*, warm up in a steam-heated kettle with stirrer, add *c* and mix to homogeneous distribution. Pour hot on flat iron pans or on stone-floor, cool, turn with shovel, grind.

Stain Removing Powder
U. S. Patent 2,022,262

For removal of iron stains from cotton and rayon textiles.

Sodium Chlorite	1 oz.
Sodium Oxalate	1 oz.
Potassium Dihydrogen Phosphate	2 oz.

Dry Peroxide Bleaching Powder
U. S. Patent 1,986,672

A bleaching powder comprises an apparently dry mixture obtainable by reacting a hydrogen peroxide solution with sodium bicarbonate and then adding anhydrous sodium carbonate all in the proportions of substantially 10 parts of 30 volume per cent of hydrogen peroxide, 6 parts of sodium bicarbonate and 135 parts of anhydrous sodium carbonate.

Bleaching and Washing Powder
French Patent 783,871

Formula No. 1

Sodium Perborate	10 kg.
Sodium Pyrophosphate	14 kg.
Soda Ash	8 kg.
Magnesium Silicate	1 kg.

No. 2

Sodium Perborate	15 kg.
Sodium Hexametaphosphate	10 kg.
Soda Ash	9 kg.
Magnesium Silicate	1 kg.
Soap	49 kg.

Stone, Brick and Masonry Cleaner
U. S. Patent 1,990,383

Forty gallons of soap-bark extract formed from 9.5 lb. of soap-tree bark by steeping in water are mixed with rosin oil 1.25, raw linseed oil 1.25, an aqueous gum tragacanth solution (containing 1.25 oz. of the gum), (1¼ to 22%) hydrochloric acid 10 gal.

Brick and Masonry Cleaner

Use a saturated water solution of ammonium bifluoride.

Drain Cleaner

Caustic Soda, Powdered	15 oz.
Chalk, Powdered	25 oz.
Caustic Potash, Powdered	60 oz.

Keep dry and pack in air-tight tins.

Washing Compounds for Use in Canning

The greatest surface is cleaned by a solution of a mixture of sodium hydroxide 2.8, soap 0.2, water glass 14.1 and sodium hypochlorite 4.8 (chlorine 2.3%) but this has some corrosive action.

Cleanser for House Façades

Trisodium Phosphate	75 g.
Sodium Metaphosphate	20 g.
Turkey Red Oil	3 g.
Sodium Hydroxide	2 g.
Water	to desired concentration

Floor Bleaches

Oxalic acid has long been used to bleach or whiten discolored wood in its natural finish, especially floors. After applying this chemical, however, the wood is left so white that the spot usually must be stained lightly to restore it to the shade of the surrounding wood. Sodium perborate, which is sold in drug stores for use as a mouth rinse and a tooth powder, is a far milder bleaching agent. Although one may have to rub the moistened powder on the discoloration a longer time than if an oxalic acid solution were used, the after effects are not so conspicuous. It is also particularly effective when mixed with equal parts of sodium metasilicate.

Cleanser for "Parquet" Floor

Saponify

Caustic Soda (128–130°)	6.64 kg.
Water	26.36 kg.
Red Oil (Oleic Acid)	45.45 kg.

Add:

Alcohol, Denatured	45.4 l.

The whole poured into

Trichloroethylene	900 kg.

The product gives a stable emulsion with water.

Cleansing Preparation for Galoshes

a.	Carnauba Wax, Fat Gray	1 kg.
	Beeswax	0.5 kg.
b.	Olive Oil Soap	0.5 kg.
	Borax	0.5 kg.
	Capillary Syrup	0.3 kg.
	Water	25 l.

Melt up *a*, dissolve *b* by short boiling, add *b* to *a* and stir until cooled, then add

Thinner (as above)	12 l.

Cleanser for Dishes, Glasses, etc.

Formula No. 1

Trisodium Phosphate	45 g.
Sodium Metaphosphate	53 g.
Caustic Soda	2 g.

No. 2

Trisodium Phosphate	55 g.
Sodium Metaphosphate	43 g.
Caustic Soda	2 g.

No. 3

Trisodium Phosphate	75 g.
Sodium Metaphosphate	23 g.
Caustic Soda	2 g.

No. 4

Trisodium Phosphate (Monohydrate)	15 g.
Sodium Metasilicate (Pentahydrate)	40 g.
Sodium Metaphosphate	40 g.
Caustic Soda	5 g.

Mechanical Dishwashing Preparation

Sodium Metaphosphate	40 oz.
Trisodium Phosphate	15 oz.
Sodium Silicate	40 oz.
Sodium Hydroxide	5 oz.

Glass Cleaners

Glass Cleaner in Cake Form

Infusorial Earth, Finest Powder	4 oz.
Precipitated Chalk	2 oz.
White Soap	2 oz.
Boiling Water	2 oz.

Reduce the soap to fine shavings and dissolve in the boiling water. Then add powders which have been previously mixed and put through a fine sieve. Press into molds the size of the cake required and allow to dry.

White Soap	750 g.
Sodium Carbonate	20 oz.
Hot Water	120 cc.
Infusorial Earth	250 g.

Dissolve the soap (in fine shavings) in the hot water in which the sodium salt has been dissolved. Then add the infusorial earth in very fine powder. These soaps may be perfumed slightly by the addition of equal parts of oil of sassa-

fras and cedar oil to suit. These soaps get very hard in the course of time, owing to infusorial earth having the property of absorbing considerable water.

The following formula is another example:

Powdered Pumice Stone	2 oz.
Ammonium Oleate	3 oz.
Ammonia (28%)	to make 16 oz.

Shake before using.

Cleaning Mixture for Beer Glasses

Use 1–3 g. per l. water of one of the mixtures (finely ground):

Formula No. 1

Trisodium Phosphate	600 g.
Sodium Carbonate	350 g.
Sodium Silicate	50 g.

No. 2

Sodium Carbonate	700 g.
Sodium Metaphosphate	300 g.

No. 3

Trisodium Phosphate	800 g.
Sodium Bicarbonate	200 g.

No. 4

Sodium Silicate	150 g.
Trisodium Phosphate	850 g.

Window Glass Cleaner

a. Mix

Neuburger Chalk, Ppt., Finest	40
Viennese Lime	20
Calcium Carbonate, Ppt., Heavy	25
Bolus, White	15

b. And grind with a mixture of

Water	90%
Alcohol, Denatured	5%
Ammonia (sp. g. 0.91)	5%

Gun Cleaner and Solvent

Turpentine	2 fl. oz.
Methyl Acetone	1 fl. oz.
Sperm Oil	2 fl. oz.
Butyl "Cellosolve"	1 fl. oz.
Kerosene	4 fl. oz.
Lanolin	1 oz.

Special Cleanser for Very Dirty Hands

Coconut or Palm Kernel Oil Fatty Acids	6 g.
Soya Bean, Linseed, Peanut Oil Fatty Acids	6 g.
Castor Oil Fatty Acid	3 g.
Pine Oil	6 g.
Alcohol	6 g.
Lanolin	1 g.
Caustic Potash (50° Bé.)	6 cc.
Water	6 cc.
Pumice, Fine Powder	until pasty
Citronella, "Spike" Oil, Terpineol as Perfume	to suit

Antiseptic Cleaner for Ice Cream Freezers

At the conclusion of the freezing operation drain the ice cream from the freezer. Rinse the strainer, hopper, and outside of the freezer, particularly at the head, with cold water. Fill the freezer two-thirds full of cold water, run one-half minute, and drain.

Fill the hopper full of water at 140° to 145° F. and add a half pound (1 cup full) of cleansing powder. Wash the strainer, hopper, and outside of the freezer with a brush. Drain the solution into the freezer (the freezer should be at least two-thirds full), run one-half minute, and drain the freezer.

Remove the head, scrub with a brush, being certain to clean out the front bearing. Wash the bearing end of the dasher with a brush, remove from freezer and wash. Place dasher and head in sanitary place until used.

Before using the freezer, fill the hopper with water at 100° to 110° F., making certain that the screen is covered. Add sufficient chlorine to give 100 p.p.m. and stir well. If desired, the chlorine solution can be pumped into the hopper from a special tank. Pour some of the chlorine solution into the front bearing. Place dasher in freezer and fasten the head in place. Drain the chlorine solution into the freezer, operate the freezer one-half minute, and drain. The freezer is then in excellent sanitary condition, except that the rear bearing may be contaminated, and is ready for use.

Lavatory Cleaner

One method is to add niter cake (acid sodium sulphate) to the water in the bowl. Another consists of a mixture of sodium carbonate (16 parts) and caustic soda (3 parts), and there are others depending on the liberation of chlorine.

A cleaner can be made up of sodium sulphate (88 parts), sulphuric acid (9 parts), and diatomaceous earth or some other fine abrasive material (3 parts).

Another suggestion is to mix powdered soap with four times its weight of powdered potassium carbonate.

Coconut Oil	10 lb.
Potassium Hydroxide	1 lb.
Sodium Hydroxide	1 lb.
Water	10 lb.

Dissolve the potassium hydroxide and sodium hydroxide in the water and mix with the coconut oil. Set aside in a warm place for a few hours to saponify. Test for neutrality and dissolve the product in 6 oz. of water. The resulting liquid soap does not cake and lathers freely when used in small quantities.

Laundry Bleach

Chlorinated Lime	1 lb.
Washing Soda	1½ lb.
Water	1 gal.

Allow to stand for a few days and filter.

Laundry Blue
Good Quality

Formula No. 1

Ultramarine	60 lb.
Bicarbonate of Soda	40 lb.
Glucose	12 lb.

No. 2
Cheap Quality

Ultramarine	18 lb.
Kiln-Dried Blue Earth	20 lb.
Terra Alba	15 lb.
Bicarbonate of Soda	45 lb.
Glucose	10 lb.

No. 3

Lime	5 oz.
Water	10 oz.

Stir until smooth and mix with a hot solution of

Dextrin, Yellow	5 oz.
Water	3 oz.
Glycerin	5 oz.
Phenol	0.2 oz.
Ultramarine Blue Powder	75 oz.

Ultramarine Blue Paste, Laundry

a.	Glue	5 oz.
	Water	10 oz.

Soak cold, then warm to dissolve.

b.	Yellow Dextrin	5 oz.
	Water	3 oz.
	Glycerin (sp. g. 1.23)	5 oz.

Mix both parts warm, conserve with 0.2% nipagin, moldex or phenol, etc., and grind now with

Ultramarine Blue or Imitation of Ultramarine	75 oz.

formed by precipitating anilinlakes (dyestuff) on insoluble inorganic bodies on china clay or white bolus.

Laundry Sour
U. S. Patent 1,998,819

A souring composition is formed of sodium fluosilicate 84, sodium acid fluoride 15 and gelatin 1, all parts by weight, or the like.

Cleanser for Hunting Calf Leather

Trioxymethylene	70 g.
Cleaning Benzoline	30 cc.
Oxalic Acid	5 g.
Liquid Soap	20 cc.

Mix thoroughly.

Cleanser for Sporting Leathers

Water	75 cc.
Acetic Acid (80%)	5 cc.
Alcohol (95%), Denatured	30 cc.

Cleaner and Disinfectant for Metal Articles
U. S. Patent 1,937,229

Sodium Silicate (D. 1.38)	300 g.

plus 500 g. of following

Sodium Hypochlorite (D. 1.125)	562 g.
Caustic Soda (D. 1.383)	250 g.

A ¼ to 2% solution of above is used.

Bleach-Bath for Used Oil Corks
(e.g. of Olive Oil Bottles)

a. Remove fats with hot alkaline solutions, as soap, soda, trisodium phosphate; wash thoroughly with hot water.

b. Hydrogen Peroxide (1.5–1.6%)	10 l.
Ammonia (25%)	200 g.

Treat corks cold (18–20° C.) for about five days, adding every 8 hours new

Ammonia (25%)	40–50 g.

Oven Cleanser
Formula No. 1

Olein, Distilled	40 oz.
Stearin	10 oz.

Mix warm.

Spindle Oil	40 oz.
Tetralin	9 oz.
Ammonia (sp. g. 0.91)	1 oz.
Emery or Pumice or Tripoli	sufficient to make pasty

No. 2

Ceresin (56–58° C.)	7 g.
Olein	17 g.
Mineral Oil	6 g.

Slate Powder	about 10	g.
Chromium Oxide	15	g.
Carborundum or Emery	about 45	g.

Printing Form and Cylinder Cleaner

Test Benzoline (B. P. 130–150° C.)	80	cc.
Xylol	15	cc.
Petroleum Oil	5	cc.

Ignition point should be over 21° C.

Rug Cleaner

Coconut Oil Soap	12	oz.
Ammonia (28%)	2.8	oz.
Glycerin	7.9	oz.
Water	77.3	oz.

Radiator Cleaner

Compound for use in hot force pump automobile radiator flushing tanks.

76% Flake Caustic Soda	60	lb.
Sal Soda	30	lb.
Rosin	10	lb.

Use about 40 lb. to 75 gal. water.

Dry Cleanser for Wallpapers

Wheat Starch	35	oz.
Sodium Chloride, Saturated Solution	65	oz.

Warm upon water-bath and stir until sufficiently plastic. Shortly before the end of this treatment, when cooled, add a little naphtha. Apply like a sponge eraser. Pack in air-tight tins.

Wall Cleaner

Corn Flour	90	lb.
Copper Sulphate	9	lb.
Alum	1	lb.

Mix and dissolve in boiling water.

Scouring Soaps

The following is a soap-sand cleaning preparation that has a wide sale for household and general purposes. It takes the form of a palm oil and coconut oil soap, which is then liquored down in the same pan with carbonate of potash, carbonate of soda crystals, silicate of soda 100° Twaddell, and water.

Melt the two oils, pass in steam, and then pour in caustic soda gently, adding a little water from time to time to keep the soap smooth. Saponification will proceed fairly easily, as the palm oil soon takes up. When all the caustic soda has been added, pour in the remainder of the water in such a way that the mass never ceases to simmer; the operation should take about 4 hours. Towards the end add the other ingredients, which will dissolve easily, as the finished product is very similar to a liquid soap.

Let the soap liquid cool to about 90° F., and to 10 lb. of dried common sand add the same amount of the above soap. All the time the soap is being added, the mass must be stirred rapidly, and when it resembles a thick sludge it will be ready to pour into tins. The only precaution to take is that the mass must not be poured in too warm, as naturally the sand would precipitate in the tins; this part of the operation can only be perfected by actual experience and must always be done very carefully, but no difficulty should present itself if all directions are carried out as given.

Mixing

Coconut Oil	4	lb.
Red Palm Oil	69	lb.
Caustic Soda, 60° Twaddle	37	lb.

Additions

Carbonate of Potash	5	lb.
Soda, Sal	15	lb.
Silicate of Soda, 100° Twaddle	21	lb.
Cresylic Acid	3	lb.
Pine Oil	1½	lb.
Orange II. (Color)	¼	oz.

The whole mass of soap and additions should total up to 784 lb., with the addition of water.

A hand-cleansing soft soap can be obtained by the use of a carbolic soft soap, preferably one made from vegetable and not fish oils, using the same proportions of soap and sand as in the previous example, but it would be better in this case to use, in place of the sand, pumice powder of 120 mesh. Sand is, naturally, coarse and cheap; better scouring agents might be used, such as silver sand, or pumice powder of 60, 90, or 120 mesh, according to the nature of the finished article desired.

Scouring Powder

Silica 100–125 mesh	75	oz.
Soda Ash	13	oz.
Trisodium Phosphate	8	oz.
Soap Powder	4	oz.

These materials in powdered form are thoroughly mixed together and are ready for use as such.

Stain Emulsifier

Liquid Soap (15%)	40	cc.
Turkey Red Oil (100%)	25	cc.
Decalin	4	cc.

Turpentine	4 cc.
Ethylene Glycol	10 cc.
Methylene Glycol	10 cc.
Methanol	5 cc.
Terpineol	2 cc.

Removing Glue Stains from Wood

Casein and vegetable glue stains can be almost entirely removed by sponging the stained surface with an oxalic acid solution prepared by dissolving 1 oz. of oxalic acid crystals in about 12 oz. of water. Still better results may be obtained by moistening the wood first with a sodium sulphate solution made up in the same concentration as the oxalic acid. In this way stains have been almost eliminated.

Remover for Tobacco Stains on Fingers

Hard Soap Powder	40 oz.
Marble Meal	20 oz.
Alcohol, Denatured	40 oz.

Soap hands with this mixture, rub at the same time with finest pumice powder.

Removing Pitch or Varnish from Hands or Glass

Household Scouring Powder
Dutch Cleanser type
Acetone
sufficient to make a thin paste

Rub the hands or article to be cleansed with this paste. The viscous impurity is at once dissolved in the acetone, and is absorbed into the powder mass. Within a minute or two the acetone evaporates, leaving a mealy or dry powder which can be dusted off, or in suitable cases as with the hands, washed off. Do not use on a painted, varnished or lacquered surface, which would be injured by the acetone. This is a very economical material for the purpose.

Soot Destroyer

Salt	85 oz.
Copper Sulphate	8 oz.
Zinc Dust	7 oz.

Steamship Chimney Soap

Soft Soap, Brown	20	g.
Water	12–15	cc.
Potassium Carbonate	1.5–2	g.
Hexahydro-cresol	1.5–2	cc.
Decahydro-naphthalene	3–4	cc.
Sodium-Di-Isobutyl-naphthalene Sulphonate	1.5–2	g.

Cleanser for Lampblack-Dirtied Surfaces

a.	Olein or Oil Fatty Acid	45.45 kg.
b.	Caustic Soda (128–130°)	6.64 kg.
	Water	26.36 kg.
c.	Alcohol	45.4 l.

Saponify *a* with *b* on water bath, dissolve, then warm (below 70° C.) in *c.* Add stirring

d. Tripoli 900 kg.

and thin 10 times with water.

Floor Sweeping Compound
Formula No. 1

Sawdust, Dyed Green with Aniline Dye, e.g., Brilliant Green	35 kg.
Rock Salt	35–40 kg.
Mineral Oil, Deodorized (2–3° E. at 50° C.)	25 kg.

No. 2

The following is a representative formula for floor sweeping compounds.

Dry Sawdust	10 lb.
Paraffin Oil	32 oz.
Hard Paraffin	2 oz.
Coarse Salt	8 oz.
Sea Sand	4 lb.

Tinned Ware Cleaner

Sodium carbonate alone is not a satisfactory cleanser for milk containers of tinned copper, since it slowly removes tin as stannite owing to the presence of dissolved oxygen. The exposed copper produces an "off flavor" in the milk. The addition of sodium sulphite reduces the rate of attack to nearly 0.1. It is much more effective than a number of other reducing agents tried because it is more active in reducing the amount of dissolved oxygen. Suitable proportions are 1 lb. sodium sulphite and 10 lb. washing soda, 1 lb. sodium sulphite and 4 lb. sodium hydroxide (or sodium carbonate).

Type Cleaner

Butyl "Cellosolve"	1 pt.
Diglycol Laurate	1 fl. oz.

Cleanser for Velvet Shoes

Water	100 cc.
Potassium Alum	1 g.
Alcohol	20 cc.
Turkey Red Oil	5 cc.

Composition for Cleaning Walls, Paint, etc.

French Patent 774,876

The composition contains corn flour 455, copper sulphate 40, alum 5 parts and is mixed with boiling water for use.

Painted Woodwork Cleaner

This specialty product quickly removes dirt from paint and leaves the painted surface with a bright, clean, lustrous finish. The diglycol stearate serves the combined purpose of emulsifying the dirt as fast as it is dissolved and of imparting a lasting natural luster to the cleaned surface. The product, therefore, may truly be said to both clean and shine in one operation. This new type of cleaner is made to the following formula.

Diglycol Stearate	1	lb.
Kerosene	¼	gal.
Trisodium Phosphate	4½	oz.
Water	12	pt.

Method of manufacture: The diglycol stearate and kerosene are heated together in a double boiler until the wax is thoroughly dissolved. Kerosene is inflammable, therefore care should be taken to prevent it from catching on fire. The trisodium phosphate is dissolved in the water and heated in another container to a temperature of about 150° F. The hot water solution is then added to the hot kerosene solution while stirring at high speed. Stirring should be continued at a good rate until the mixture is of even milky consistency. Mixing may then be continued at a slow rate until the batch has cooled to around 85° F.

This product is applied in the usual manner by rubbing with a rag or cloth. The same product may also be used for cleaning automobiles before waxing. However, for this service 12 oz. of fuller's earth should be thoroughly worked into the above batch after it has cooled over night. The fuller's earth should not be added until cooling is complete. With this addition a product is produced which cleans rapidly and without scratching the finish.

"Soluble" Pine Oil Fluid

A satisfactory clear, pale straw pine concentrate, which is perfectly stable and gives a dense milky emulsion when added to water can be made from the following formula:

Heavy White Pine Oil	70 cc.
Oleic Acid	12 cc.
Water	18 cc.

The procedure is very simple—dissolve the oleic acid in the pine oil in the cold, and neutralize carefully with a 28% solution of caustic potash or soda. Caustic potash gives a slightly better color than caustic soda. By this method no heat whatever is required.

Soap Towel

U. S. Patent 1,969,900

A towel for cleaning surfaces consists of a paper towel carrying a detergent composition including pine oil about 3–10 parts, a soap about 0.3–0.6 parts and water about 85–95 parts.

Sodium Metasilicate Solutions

Solutions containing 20 g. per l. of a commercial detergent preparation (sodium silicate 40, baking soda 30, soap powder 20, sodium perborate 10) show turbidity a few hours after preparation followed by precipitation; this renders it useless. Solutions of 5–10 g. per l. of sodium silicate begin to precipitate in presence of 35–40 g. baking soda per l. and precipitation is instantaneous with more than 40 g.; a solution of 15–30 g. per l. of sodium silicate begins precipitating in presence of 20–25 g. baking soda. Substitution of trisodium phosphate for baking soda immediately corrects the trouble.

Movie Film Cleaner

Carbon Tetrachloride	65 oz.
Ethylene Dichloride	10 oz.
Petroleum Ether	25 oz.

This composition is used to clean dirt, greasy spots and all foreign matter off of both faces of a movie film without affecting or having any solvent action on the film or gelatin coating itself.

The petroleum ether is a light fraction distillate with an end point under 100° C. These solvents are mixed together and are then ready for use.

Benzine Soap

Dissolve 10 lb. of curd soap in boiling water, add a strong solution of magnesium sulphate slowly with stirring until it is all transformed into an insoluble mass, skim off the magnesium soap thus formed and purify by boiling it with fresh water. Remove the excess of moisture by squeezing through a cloth and pressing. Place the soap in a jacketed copper kettle and heat slowly to 266° F., turn off the heat and add 7 lb. of deodorized petroleum distillate. Dissolve

the product in 22 gal. benzine. If the solution is not clear the water has not been completely removed. For garment cleaning use 1 qt. of this solution for 25 gal. of benzine.

Dry Cleaning Solvents for "Celanese"

The following chemicals are safe for cellulose acetate fabrics: gasoline, Stoddard's solvent, cleaner's naphtha, kerosene, dilute alkalies (such as soap and water, soda, ammonia, sodium hypochlorites, Javelle water and washing sodas), glycerin, carbon disulphide, turpentine, all the hydrosulphite solutions (such as decolorite, blanket, sulphogen, burmol, paragene and lykopon), petroleum ether, vaseline, toluol, xylol, good grades of wood or denatured alcohol used cold and washed thoroughly, sulphuric ether, trichloroethylene, benzol, which is one of the best all around spotting chemicals, and unadulterated carbon tetrachloride, which is rapidly taking the place of chloroform. It is a known fact that carbon tetrachloride will absorb a small amount of moisture from the air if the container is left open. If moisture is present this powerful solvent is crippled and will not be as effective as when dry. To test carbon tetrachloride for purity, take two parts mineral oil, such as Nujol, and one part carbon tetrachloride. Mix. If this mixture becomes milky it denotes the presence of water in the carbon tetrachloride and in this condition should not be used for spotting purposes.

Dry Cleaning Soap

Curd Soap	30 oz.
Water	40 oz.
Ox Gall (Dried)	10 oz.
Soda Ash	5 oz.

Shred the soap and dissolve in hot water, adding the ox gall and soda. Evaporate the solution until on cooling, a sample on a slab sets solid. Pour the mixture into trays or molds. The disadvantage of such a preparation is its rather unpleasant smell.

Dry Cleaning Soap
British Patent 407,088

Fourteen and two-tenths grams of sodium hydroxide is dissolved in 25 cc. water and stirred into 100 g. oleic acid and 100 cc. trichloroethylene; 70 g. triethylene glycol or 50 cc. diethylene glycol is added and the product is dissolved in trichloroethylene for dry cleaning.

Textile Soap
French Patent 658,412

Castile Soap	200 lb.
Tallow Soap, Powdered	95 lb.
Soda Ash	20 lb.
Borax	10 lb.
Turpentine	25 lb.
Caustic Alkali	20 lb.
dissolved in 30 of water	

Kier Soap

Red Oil	2050 lb.
Rosin	1050 lb.
Soda Ash	290 lb.
Caustic Soda (50° Bé.)	746 lb.
Water to make	11000 lb.

Ox Gall Soap

Since ox gall derived from bile has an unpleasant smell, an improved method is to add to soap solution about ¼% of sodium cholate, the sodium salt of cholic acid which is a purified decomposition product of bile. It is claimed thus that the advantages of the detergent power of ox gall are obtained without the accompanying odor.

Rose Soap

a.	White Tallow Soap	10000 kg.
b.	Moistened Cinnabar	60–80 kg.
c.	Rose Essence	40 kg.
	Clove Essence	15 kg.
	Cinnamon Essence	10 kg.
	Neroli Essence	10 kg.
	Bergamot Essence	30 kg.
	Perfume	

Windsor Soap

a.	White Tallow Soap	10000 kg.
b.	Bergamot Essence	60 kg.
	Caraway Essence	25 kg.
	Clove Essence	16 kg.
	Thyme Essence	25 kg.
	Perfume	
	or	
b.	Bergamot Essence	25 kg.
	Caraway Essence	60 kg.
	Rosemary Essence	15 kg.
	Fine Lavender Essence	15 kg.

Witch Hazel Soap

Witch Hazel Extract U.S.P.	10 oz.
Distilled Water	10 oz.
Triethanolaminelauryl-sulphonate	80 oz.

Perspiration Odor Destroying Soap

Aluminum Chloride Crystals	3 oz.
Hydrochloric Acid 1/10 Normal	1–2 oz.
Triethanolamine-laurylsulphonate	96–95 oz.

Soft Soap Manufacture

Soft soap contains normally 40 to 44% of fatty acids. The best method of saponification is to take the calculated quantities of alkali sufficient to effect complete saponification, with an excess of 1 to 1.5% alkali. The caustic solution, preferably of a density of 30° Tw. (about 19° Bé.), is brought to a boil and the melted charge added as quickly as possible without the contents frothing over. Emulsification follows with rapid saponification. The process is usually complete in a few hours' time, water being added when necessary. If rosin is to be incorporated, it is best added after the other stocks have been saponified.

Unless castor oil is present a soft soap charge cannot be worked with caustic soda alone. With caustic soda, castor oil will form a soft soap. Soft soaps can be made with castor oil in which varying proportions of other stocks have been introduced with the substitution of varying proportions of caustic potash for caustic soda. Saturated fatty acids tend to give stringy soap even with potash. The higher these are in the homologous series, the more pronounced is the stringiness.

The percentage of caustic soda which can be substituted for caustic potash will depend on the percentage of castor oil introduced into the blend. Practical experiments indicate that about 2% of caustic soda can be substituted for caustic potash for every 1% of castor oil introduced into the blend. Use of caustic soda in this way does not affect translucency and gloss.

Linseed-soda soap is stringy, but the corresponding potash soap is non-stringy with a desirable body. Peanut oil-soda soap is stringy but the potash soap is not. The following blends suggest the possibilities for soft soap manufacture:

The charges given below produce a stringy soap with 80% caustic potash and 20% equivalent caustic soda, but have the right non-stringy body with caustic potash only:

Formula No. 1

Peanut oil 20 parts, linseed oil 50, cottonseed oil 20, tallow 5 and rosin 5.

No. 2

Peanut oil 20 parts, linseed oil 50, cottonseed oil 20 and tallow 10.

No. 3

Linseed oil 60 parts, cottonseed oil 30 and rosin 10.

No. 4

Linseed oil 65 parts, cottonseed oil 25, rosin 10.

No. 5

Linseed oil 67 parts, peanut oil 13, cottonseed oil 10, tallow 5 and rosin 5 can be used with 80% of caustic potash and 20% equivalent caustic soda to give an almost non-stringy soap with only a slight thready tendency.

No. 6

Linseed oil 73 parts, cottonseed oil 15, rosin 10 and coconut oil 2 can be used with 70% of caustic potash and 30% equivalent caustic soda to give a non-stringy soap. In general it is preferable to use more potash. This represents the lower limit of potash with this type of blend.

No. 7

Linseed oil 73, castor oil 20, rosin 5 and coconut oil 2 gives a correct non-stringy soap with 60% caustic potash and 40% equivalent caustic soda, due to the introduction of castor oil.

The following blends with higher percentages of castor oil give non-stringy soap with caustic soda alone:

No. 8

Linseed oil 38, castor oil 50, coconut oil 2 and rosin 10 parts.

No. 9

Linseed oil 32, castor oil 45, coconut oil 3 and rosin 20 parts.

No. 10

Linseed oil 50, castor oil 35, coconut oil 3 and rosin 12 parts.

Soap Rancidity, Preventing

This is best done by kneading into the dry soap, before milling, .7% of the following mixture:

Beeswax 300, anhydrous lanolin 400, liquid paraffin 390, water 300, borax 17, sodium thiosulphate 690, water 200. Melt together the wax, lanolin and paraffin oil; then dissolve the borax in 300 parts of water and pour this solution in a thin jet into the hot mass of molten fats at a temperature of about 95° C. Boil for a few minutes longer, then set aside and let cool to 50°, stirring frequently. Pour the hot solution of sodium thiosulphate in 200 g. of water into the fat-borax emulsion in a thin jet and stir until smooth. In some cases, for example

when using an unusually large quantity of perfume, it is advisable to add 1% of the following:

Beeswax 200, anhydrous lanolin 600, liquid paraffin 390, water 200, borax 17, sodium thiosulphate 690, water 200, sodium silicate 450, granulated sugar 253.

Superfatting Soap

Use of a superfatting agent undoubtedly improves the texture of soap, making it more plastic and easily worked. It also tends to neutralize any alkali which might be present, and thus remove harshness which might irritate sensitive skins. A good mixture for this purpose consists of equal parts of stearin and white petroleum jelly, or 2 parts stearin, 1 part lanolin, and 1 part white petroleum jelly. These are melted, mixed, allowed to cool, and 1 to 1½ lb. added per 100 lb. of chips added with the other ingredients at the mixing stage.

Soap Spirit

Olive Oil	1000 cc.
Caustic Potash (50%) about	396 cc.
Distilled Water	2600 cc.
Alcohol (90%)	6000 cc.

Softener for Hard Water

Water Glass (36–38° Bé.)	25 oz.
Water	25 oz.
Ammonium Carbonate about	50 oz.

Mix well (warming), pour off to solidify the paste. When cool, grind and add to 95 oz. of the material.

Trisodium Phosphate	50 oz.

Starches and Sizes for Cotton Sheeting

Formula No. 1

Cornstarch	100 lb.
Castor Oil	½ pt.
Color	to suit
Water	220–240 gal.

Boil together until smooth.

No. 2

Cornstarch	100 lb.
Gypsum	80 lb.
Castor Oil	1 pt.
Color	to suit
Water	220–240 gal.

No. 3

Cornstarch	60 lb.
Lard	5 lb.
Blue Dye	2–4 oz.
Water	120 gal.

No. 4

Cornstarch	65 lb.
China Clay	10 lb.
Lard	5 lb.
Color	to suit
Water	120 gal.

No. 5

Potato Starch	100 lb.
Steeped Flour (24° Tw.)	10 gal.
Slaked Lime	15 gal.
China Clay	15 gal.
Elaine (Red) Oil	3 pt.
Blue Color	12 oz.
Water to make	120 gal.

Boil for 1–2 minutes.

Cream Sizing

Tallow	36 lb.
Calcium Chloride	6 lb.
Starch	7 lb.
Gum Arabic	6 lb.
Water	45 lb.

Cook and stir at 220–230° F. for 1–2 hours.

Sizing Rayon and Silk

French Patent 779,584

Rayon and silk are sized to give firmness, elasticity and suppleness by a solution in water of

Formula No. 1

Stearic Acid	15 g.
Glue	35 g.
Gum Arabic	8 g.
Soap	32 g.
Glycol Stearate	18 g.
Borax	2 g.
Pepsin	0.15 g.

No. 2

Lauric Acid	20 g.
Gelatin	34 g.
Soap	30 g.
Gum Arabic	8 g.
Ethylene Glycol	6 g.
Borax	2 g.
Trypsin	.05 g.

No. 3

Glue	20 g.
Gum Arabic	5 g.
Glycol Stearate	8 g.
Soap	18 g.
Glycerin	8 g.
Borax	1.2 g.
Pepsin	.01 g.

Rayon Size

Calcium Resinate	20 lb.
No. 1 Lard Oil	10 lb.
Xylol	35 lb.
Damar Gum	10 lb.

Manipulation: Dissolve the damar gum in the xylol and add the other ingredients at 50° C. Then cool slowly with agitation.

Light Goods Sizing

Formula No. 1

Soluble Potato Starch	1½–2½ lb.
Glucose	3 –5 pt.
Water	5 gal.

The starch and glucose are entered into the water and the whole brought to a boil and continued at that temperature until the starch particles are entirely cooked, which will depend upon the particular type of starch used. Before using, the mixture should be allowed to cool to a temperature of about 180° F. The purpose of the glucose is to impart a soft feel to the material and may be omitted.

No. 2

Another mixture that is suitable for setting goods other than those constructed of rayon, is to 1 to 3 lb. of white finishing gum to 5 gal. water.

A mixture that may be recommended for producing a soft, lustrous finish, and particularly for rayon braids, is given below:

a. Gum Arabic dissolved in 1 gal. Water	1 lb.
b. Gum Tragacanth dissolved in 1 gal. Water	¼ lb.

Use one part solution *a* and one part solution *b* to 4 to 5 parts water and apply lukewarm.

Running the goods through plain, lukewarm water and then through the calender will often remove wrinkles that have been developed in the process of dyeing.

Glue is the substance most often employed for stiffening braids, as well as other textile fabrics. This ingredient comes in many different qualities, and the grade required will depend upon the quality of the material to be treated and the result desired. The flakes or granules of glue should be allowed to dissolve in water some time before it is to be needed at the finishing machine, and as glue varies greatly, it is advisable to experiment with each new lot before proceeding with any quantity of material.

Various substances are used to prevent the size bath from souring. Among these are zinc chloride, sodium fluoride, bluestone, and formaldehyde. Any of these chemicals are used in very small quantities.

Textile Size

Glucose	7 lb.
Soluble Oil	3 lb.
Magnesium Sulphate	1 lb.

Textile Paste or Size

Potato Starch	100 lb.
Calcium Chloride	300 lb.
Water	300 lb.

Manipulation: Soak starch and calcium chloride in the cold water for 2 hours then gradually heat mixture to boiling. Boil for 1 or 2 hours until a thick paste is formed.

Equipment: Clean wooden vat with open steam for boiling.

Cleaning Solvents for Textiles

Formula No. 1

Carbon Tetrachloride

No. 2

Carbon Tetrachloride	850 cc.
Heavy Benzoline, Purified	150 cc.

No. 3

Heavy Benzoline, Purified	640 cc.
Ethyl Ether	120 cc.
Turpentine Oil, Purified	120 cc.
Ethyl Acetate	120 cc.

(Inflammable!)

No. 4

Heavy Benzoline, Purified	600 cc.
Turpentine Oil, Purified	120 cc.
Ethyl Ether	160 cc.
Ethyl Acetate	120 cc.

(Inflammable!)

No. 5

Carbon Tetrachloride	650 cc.
Alcohol	100 cc.
Ethyl Ether	100 cc.
Heavy Benzoline, Purified	80 cc.
Soap Spirit	50 cc.

No. 6

Trichloroethylene

Scouring Rayon Circular Knit Fabric

1. Run water in kettle (80–120° F.) using minimum amount that will enable the fabric to run freely over the reels. A properly loaded kettle of the correct type requires approximately a 20 to 1 bath.

2. Load kettle with fabric.

3. Add 2 lb. soda ash or trisodium phosphate (depending upon water conditions).

4. Turn on steam and run goods for 10 minutes.

5. Add 3 lb. high grade neutral soap—olive or red oil base.

6. Add 2 lb. "soluble pine oil" or a similar solvent containing material. If desired this solvent material and soap can be added simultaneously in order to aid solvent dispersion.

7. Raise bath to boil. Observe condition of bath at all times. If bath does not show a good, clean, sudsy condition, add more soda soap and pine oil. It is impossible to accurately predict the amount of soda soap and solvent or the exact proportions of the same that will be required under an unknown set of conditions.

8. Run the kettle at or near the boil for 1 hour.

9. Drop bath and proceed with bleaching or dyeing operation.

Cleaning Tent Canvas

Mildew can be removed from a tent by sponging the canvas with a weak solution

of calcium hypochlorite, or bleaching powder. Be sure to wash the solution out well after using.

Cotton Textile Printing

For the shading of the pink print a paste is prepared with 40 parts of Irisamine G, that are dissolved in 400 parts of iron-free water. The resulting solution is then incorporated into 500 parts of starch tragacanth thickening, warming for a short time, agitating until the mass reaches 60–70° C., and entering 80 parts of acetate of chrome at 18° Bé., and bringing to 1000 parts through adding more water if this is necessary.

The starch tragacanth thickening, required in the above case, is prepared with 60 parts of wheat starch and 50 parts of wheat flour, that are made into a uniform semi-transparent paste with 700 parts of water, adding to this while still boiling 200 parts of a 6½% gum dragon mucilage and 30 parts of olive oil. The bath being brought with water to 1000 parts in all.

For the back of the pink print 200 parts of the above color paste are measured out and mixed first in a warm bath containing 800 parts of the starch tragacanth thickening, and then with 2 parts of acetate of chrome at 18° Bé. and 5 parts of acetic acid at 6° Bé., that are added at the right moment in the cooling down bath.

The shading product, needed for the red print, is obtained with 10 parts of a suitable brand of safranine, that are dissolved in 90 parts of acetic acid at 6° Bé., 10 parts of acetin and 300 parts of iron-free water. The resulting solution is then added into 500 parts of the starch tragacanth thickening indicated above, and after cooling sufficiently (60–70° C.) are entered 60 parts of a 50% tannin acetic acid solution and 40 parts of acetic acid at 6° Bé., bringing the whole to 1000 parts with further water.

For the backing of the red print a fourth printing paste is prepared with 2 parts of a suitable safranine, dissolved in 20 parts of acetic acid at 6° Bé., and 350 parts of iron-free water. The resulting solution is then poured into 550 parts of the starch and gum dragon thickening, and when this has been properly incorporated, steam is turned off, and the bath is left under the action of the agitator until 70° C. has been reached. Fourteen parts of a 50% tannin acetic acid solution, and 20 parts of acetic acid at 6° Bé. are then poured in, in close succession. The bath is made up after this to 1000 parts with further water.

The cotton cloth is printed with the above four color pastes, dried by passing through the hot-flue, and steamed for 1 hour without pressure, or for half this time with one half atmosphere. After the steaming, the goods are treated in a 1% tartar emetic bath at 50° C., rinsed for some time and dried. If the free acid in the goods is not eliminated in this way, the cotton cloth is passed through a second bath containing from 5 to 10 parts of chalk per l. of iron-free water, giving a second rinsing, and drying and finishing.

If the printing is to be conducted on a pure white cotton cloth, the cost of treatment is much reduced, as a direct printing process is only required. This can be conducted with one of the pastes given below, the first of which requires, after its application and drying, a two hour steaming at 1 atmosphere pressure, while the second needs instead a one hour steaming with one-half atmosphere. Both colors being improved by a soaping.

Formula No. 1

Two and a half parts of alizarine black in paste S are mixed with ½ part of acetic acid at 6° Bé. and 6½ parts of a suitable starch thickening. The mixture is warmed until obtaining uniformity. After this it is allowed to cool down somewhat, and is entered ½ part of acetate of chrome at 20° Bé. bringing to 10 parts in all with water.

No. 2

Three hundred parts of a suitable brand of chrome orange are incorporated with 620 parts of acid thickening and 80 parts of acetate of chrome at 20° Bé., using the necessary precautions for avoiding loss of acetic acid. The acid thickening is prepared by boiling 210 parts of wheat starch with 570 parts of iron-free water, after having conducted properly the mixing in the cold. When a semi-transparent adhesive has thus been produced steam is turned off, and toward 70° C. are entered 220 parts of acetic acid at 6° Bé., bringing with water to 1000 parts in all.

If the cotton material is colored in a light pink, this is obtained by dyeing on the jigger or on the padding machine with a suitable bath of Erika GN, shaded or not with Chrysophenine G; with a bath or Benzo fast scarlet 4BS (using the correct percentage), of Diamine rose BD, or of any other substantive pink; rinsing, drying and printing with the following color paste:

Seventy-three parts of Ciba red G in paste are mixed with 27 parts of a 33% British gum thickening, and passed through a fine sieve, bringing then with water to 100 parts. Fifty-five parts of the above mixture are then entered in 12 parts of further 33% of British gum thickening, adding a little later 20 parts of caustic soda lye at 36° Bé., and 6 parts of glycerine. The whole is warmed just sufficiently for obtaining a uniform incorporation, and after having allowed the bath to cool down to about 50° C., are entered 7½ parts of hydrosulphite NF concentrated, bringing with water to 100 parts.

When the cotton cloth goods have been printed with the above pink paste for obtaining the necessary details in the flowers and in the dark ground, the material is dried and steamed from 4 to 5 minutes at 105–107° C., being then left to hang for a short time, and finally treated with a bath furnished with 5 parts of olive oil or cottonseed oil soap and 2 parts of calcined carbonate of soda for every thousand parts of iron-free water, the bath being kept all through towards 60° C. After this the goods are given a last drying and are finished.

Logwood Speck Dye

Logwood Extract 51° Tw.	48 lb.
Soda Ash	30 lb.
Bluestone	12 lb.

This should be diluted to about 2–3° Tw.

Seal Brown Cotton Dye

Cutch	35 lb.
Hypernic Extract	16 lb.
Logwood Extract	3½ lb.

Add to dye bath and boil until dissolved, then add 3 lb. bluestone, add cold water, rake well and enter yarn. Give 6 turns and put down over night. Take up, give 6 turns, introduce into a solution of 4 lb. chrome at 160° F. and give 6 hours. Remove, wash well in cold water, put back in cutch liquor, 6 turns; into chrome, 4 turns; into cutch, 4 turns; into chrome, 4 turns. Wash off each time after chrome. Start new kettle with

Fustic Extract	7 lb.
Logwood Extract	3½ lb.

Boil well for 2 hours.

Violet Logwood Textile Ink

Logwood Extract (Weak)	300 lb.
Alum	12 lb.
Dextrin	15 lb.

Dissolve the alum by heating in a part of the extract solution. Finally 1½ lb. finely powdered lead acetate are slowly added and dissolved.

Textile Padding Liquor

Acetic Acid 50%	2 gal.
Formic Acid 85%	3 gal.
Glauber's Salt Crystals	40 lb.
Water	to make 100 gal.

The goods are padded on the face and the drying cylinders must not be too hot at first, so that sticking of the prints may not take place. Moderate drying in the initial stages should be the rule but at the same time if drying is not carried out properly there will be a grave danger of marking-off on the cylinders if any of the print color is allowed to adhere during the process. The wrapping of the first cylinder is sometimes advised in order to prevent sticking, but the circumstances in each case will dictate the precautions which will have to be taken. Two or three cylinders in any event will be found sufficient for the full development of the colors.

Preparation of Print Colors

In using the powder brands the following method of producing a print color is normally adopted.

Dyestuff Powder	8–16 oz.

is pasted with

Caustic Soda Solution (70° Tw.)	⅛–¼ pt.
Monopol Oil or Similar Soluble Oil	⅛ pt.

and

Neutral Chromate Solution	¼ pt.

The mixture is then allowed to stand for a short time before being added to

Water	2–3 pt.

and

Starch-Tragacanth (Thickening as Required)	4–5 pt.

Making the whole up to

Printing Paste	1 gal.

For the production of lighter shades from the above standard a thickening of the following type is made up.

Neutral Starch-Tragacanth	1 gal.
Caustic Soda Solution (70° Tw.)	1/16 pt.
Neutral Chromate Solution	¼ pt.

The neutral chromate solution is prepared in the following manner:

Sodium Bi-Chromate Crystals	1½ lb.

dissolved in

Water	6	pt.

To this add

Caustic Soda Solution (70° Tw.)	22	oz.

Make up to

Neutral Chromate Solution	1	gal.

The paste brand dyestuffs are prepared as follows:

Dyestuff	1	pt.
Neutral Chromate Solution	8	oz.
Monopol Oil	¼	pt.
Water	2	pt.
Neutral Starch-Tragacanth	5	pt.
Printing Color	1	gal.

Thickening for Hand Printing on Silk

Formula No. 1

Mix

White Starch	5	lb.

and

White Dextrin	5	lb.

with

Acetic Acid, 12° Tw.	7½	lb.
Olive Oil	2	lb.

and then add

Water	2½	gal.

Boil to a paste.

No. 2

Mix

White Starch	5	lb.

with

Water	1	gal.

and

Glue	2½	lb.

previously dissolved in

Water	2½	gal.

Boil to a paste, cool and add

Acetic Acid, 7° Tw.	5	lb.
Olive Oil	2	lb.

Stir well.

Coloring Bone Articles

The chief difficulty encountered in coloring bone material such as chess and other game counters, buttons, horn handles for umbrellas and walking sticks, ornamental vases and similar bric-a-brac of this type, etc., consists in obtaining good penetration of the dye. It is an unfortunate fact that certain acid and basic dyes of poor fastness to light will penetrate bone material better than some of the faster colors. Where penetration is too shallow, bone articles subjected to much handling like chess and draughtsmen, umbrella and walking stick handles and so on, soon disclose unsightly light places where the superficial film of coloring matter has worn off.

Bone material is commonly dyed in a nested copper kettle, the inner container which carries the stock being perforated with small holes for the circulation of the liquor. The container can be lifted from the outer casing when it is desired to examine the stock during processing. Coloring of bone material is usually performed before it is polished, as treatment in hot liquor would roughen the surface of polished goods. When small articles like buttons, electric bell and light switch press-plungers, ivory sectors for inlay and marqueterie designs and so forth are to be colored, handling of the stock is facilitated by processing it in bags of linen net, each bag having a capacity of about 8 oz. of stock.

It is customary to boil-off bone material in clean water before coloring it. If the stock contains traces of oil or grease acquired during turning and fret-cutting of ornamental pieces, a small amount of pearl ash is put into the boil-off bath in order to emulsify the fatty substance. It is well to be sparing in the use of the alkali because the employment of an excessive amount will turn the bone a yellowish color. The use of soap for boiling-off is also apt to bring about this yellow discoloration in the stock; moreover, the presence of residual soap during coloring of the bone material will hinder penetration. The usual duration of the boil-off is from 15 to 60 minutes, according to the size of the pieces in the stock and the kind of bone. Antler and tusk material is harder and less porous than stock manufactured from sawn bone of bovine origin.

When the stock has been taken out of the boil-off kettle, it is plunged into the boiling dyebath, which is already fully charged with the appropriate dyestuff. Boiling proceeds for 30 to 60 minutes and then the stock is allowed to steep in the cooling bath for several hours in order to encourage penetration. It is not always advisable to process thin pieces made of horn at boiling temperature for longer than a few minutes, because of the risk of distorted material through softening of the structure in the hot liquor.

The following dyes may be employed for processing fast-to-light colors on bone material. Afterchrome Black of the PV type; Alizarine Brilliant Green G; Cloth Fast Yellow R; Eriochrome Red G; Erio Fast Brilliant Blue 3R; Radio Brown B; Cutch Extract; Logwood Extract. Afterchrome Black is applied to bone material in a boiling bath containing 1% of 30%

acetic acid. After processing for half an hour, 1% of sulphuric acid 168° Tw. is added and boiling is continued for a further half hour. The stock is then allowed to steep in the cooling bath for some hours, after which it is plunged into a fresh bath containing a boiling solution of bichromate of potash, the amount employed being from 1 to 2%. After 15 minutes processing at the boil, steam is turned off and the stock is left to steep for a further period of 15 minutes and then it is lifted and rinsed in warm water.

Alizarine Brilliant Green G yields fine blue-green hues of high fastness to light on clean white bone stock; when this color is used on discolored stock, or the darker sorts of horn material, the shade which ensues is a bottle-green color. Alizarine Brilliant Green G has good affinity for bone when applied in a boiling neutral bath. For deep shades with this dyestuff, an addition of 1% of acetic acid should be made to the bath after processing neutral for half an hour. Cloth Fast Yellow R also possesses good affinity for bone in neutral liquor. Deep hues may be processed with an addition of acetic acid, this to be put in when the bath has boiled for half an hour. Eriochrome Red G yields rich red on bone stock. Dyeing should be commenced with the addition of 1% of acetic acid and when the bath has boiled for half an hour, 1 to 2% of bichrome may be put in. If the stock is hard tusk, boiling should be kept up for an hour before the bichrome is used. Erio Fast Brilliant Blue 3R produces a lively and very durable reddish-violet color on clean white bone material. This dyestuff has very good affinity for bone in a neutral bath. When processing a full shade, an addition of 1% of acetic acid may be made after the bath has boiled one hour.

Radio Brown B is a useful dyestuff for processing light or dark brown hues of first-rate fastness to light on bone stock. The affinity in a neutral bath is not good, hence an addition of acetic acid may be used at the commencement of dyeing. After the bath has been boiled for about half an hour, the color may be exhausted by an addition of 1% of sulphuric acid.

Cutch extract is an old favorite amongst bone dyes. This substance yields olive-gray to rich brown hues on bone, the shade depending on the processing method adopted. To produce olive-gray on bone stock, the material is boiled for 30 minutes in a bath containing 10 to 20% of dry cutch extract, and 1–2% of acetic acid. Steam is then cut off and the stock allowed to feed in the cooling bath for 8 to 10 hours. The material is then put into a net bag and suspended in an empty barrel into which steam is blown for 10 minutes. The jet of steam must not impinge directly upon the stock. Oxidation of the cutch which has been absorbed is then completed by exposing the bone pieces to the air while they are spread out in shallow trays. In order to develop the olive-gray coloration, the stock is plunged into a boiling bath containing 2 to 5% of green copperas. Steam is cut off after the material has boiled for 15 minutes, after which the stock is left to steep for half an hour and then rinsed. The olive-gray hue produced in this manner has long been a popular color for the bone platings on pocket knives. If it is desired to process orange-brown or deep reddish brown with cutch, development of the color is done with bichrome and copper sulphate instead of green copperas. When deep colors are being processed on bone material with cutch, or other natural coloring matters, it is usually necessary to remove the film of loose color and resinous impurities which forms on the surface of the bone during processing. If this film is not cleaned off, it clogs in the bone and hinders development of the final color during after-treatment with the metallic salts. In order to cleanse the stock, the pieces are put in the loose condition into a tumbler apparatus containing a thin paste of sawdust and water, or preferably cow dung and water. When the device is set into motion, the movement of the stock in contact with the sawdust, etc., cleanses away the film.

Logwood extract is sometimes combined with cutch for the purpose of modifying the tone of the latter. Logwood extract is also used for deep black on bone articles, the process consisting in boiling the stock in a solution of logwood extract, followed by the oxidation of the hematine by steaming and exposure to the atmosphere. After the material has been freed from film in the tumbler apparatus, the black color is developed in a boiling bath containing copper suphate and green copperas. A black of this kind is not as fast to light as afterchrome black, but penetration is frequently better than in the other instance.

Dyeing Vegetable Ivory Buttons

The following is suggested with the use of basic dyes: The buttons are boiled in water for 1–2 hours before dyeing. Pale shades are dyed for 2 hours at the boil in

a neutral bath; if the water is very calcareous, some acetic acid must be added.

Full shades are first mordanted for 4 hours in a bath prepared with 40 parts tannin per 1000, then rinsed in cold water and treated in a bath prepared with 20 parts tartar emetic per 1000 for ½ hour at 120–140° F. The buttons are then rinsed for ½ hour with boiling water in order to remove the free mordant and dyed in a fresh bath acidified with acetic acid.

Dyeing Brush Bristles

When dyeing fiber materials to be used for the manufacture of brushes, etc., and necessitating the material being dyed through well, it is best to use a combination of about 2–3% of a direct black and 2–4% logwood extract.

Charge the starting bath with 2% ammonia and ¼–½% soda ash, add 2–3% dye previously well dissolved in condensed water, and then about 5% cryst. Glauber's salt; boil up well, enter the material, work for 5–10 minutes, cover with a lattice frame weighted with stones, boil for 2–3 hours, and allow to feed for ½–1 hour in the cooling bath. Then lift the material, allow it to lie exposed to the air for several hours, and enter into a fresh bath heated to 30–40° C. (85–105° F.) containing pyrolignite of iron of 4–7° Tw.; leave in this bath for ½–1 hour, throw out and leave exposed to the air for several hours, rinse well and dry.

If so-called patent or luster-fiber is to be produced, the method of working is exactly as described above; only the fiber is finally taken through a bath of 40–50° C. (105–120° F.) charged as follows:

Liquor	10	gal.
Gelatin Glue	2	lb.
Soft Soap	2	lb.
Logwood Extract	2	lb.
Fustic Extract	½	lb.
Pyrolignite of Iron	½	lb.

Treat the goods in this bath for 30 minutes, allow to drain, and brush dry with suitable brushing machines. If the fiber is not lustered, 8 oz. of whitening per 10 gal. liquor are added to the bath of pyrolignite of iron.

The dye liquors may be used repeatedly; dyeing in the standing bath requires about ½–⅔ of the stated quantities of dye and logwood extract, equal quantities of soda and ammonia, and about 3% salt calculated on the weight of the goods.

Coconut Fiber Dyeing

Dyestuff	30 lb.
Acetic Acid, 30%	90 lb.
Glycerin (only where the goods will be steamed after printing)	30 lb.
Water	400 lb.
Tragacanth Thickening	450 lb.

If the mats are to be steamed, the operation is carried out in a cottage steamer, the duration of steaming being from a quarter to half an hour without pressure. The mats are hung on rustless metal hooks riveted into movable metal strips which span the interior of the steaming cottage. The stock is seldom washed after steaming, unless the thickening has been made too good with the result that the printed portions handle stiffly. Basic dyes are apt to lose depth during washing, even when the stack has been steamed; hence, washing is only done where the necessities of the case call for it. Some printers regularly make an addition of tannic acetic acid to the print color in order to heighten the resistance of basic color to washing and to general wear in the domestic sphere. The following basic colors are suitable for use in printing coir matting: Phosphine, rhodamine, magenta, safranine, methylene blue, malachite green, methyl violet, bismarck brown, jute black.

Substantive dyes prove useful for printing coir in designs of good fastness to washing. This class of dyes should be steamed after printing in order to obtain good results. The printing paste is made as follows:

Substantive Dyestuff	30 lb.
Water	370 lb.
Phosphate of Soda	30 lb.
Glycerin	70 lb.
Tragacanth Thickening (40:1000)	500 lb.

The following substantive colors are suitable for printing coir: Chrysophenine G, Direct Fast Scarlet 4BS, Benzopurpurine 4B, Direct Bordeaux 6BS, Direct Brown G, Direct Brown M, Direct Fast Pink BK, Direct Green B, Direct Sky Blue FF, Direct Black BH, R, E. After the mats have been printed, they are allowed to become partially dry and then they are steamed without pressure for half an hour. They are then rinsed in cold water.

Bleaching Coconut (Coir) Fiber

The bleaching process with hypochlorite is carried out in a cold bath after the coir stock has been boiled out in a solution of caustic soda. From 3 to 7 lb. of

commercial hypochlorite of soda solution are used per 100 gal. of water in the bleach bath. The stock is allowed to remain in the kettle for from 1 to 8 hours after which it is soured in a fresh, cold bath containing 1½ pt. of hydrochloric acid, 30 to 34° Tw. per 100 gal. of water, and subsequently well rinsed. The batch is then ready for antichloring, this process consisting of immersing the coir for a period of 10 minutes in a fresh, cold bath charged with 1¼ lb. hyposulphite of soda crystals per 100 gal. water. After this has been done, the stock is thoroughly rinsed in cold water, then steeped for several hours in two or three changes of water and finally centrifuged.

To bleach coir stock with permanganate of potash and bisulphite of soda, the material is first boiled out in a kettle with 3% caustic soda and after being rinsed, it is immersed for 12 hours in a cold solution of permanganate of potash, ¾° Tw. The stock is then rinsed and entered into a fresh cold bath containing a solution of bisulphite of soda ¾° Tw. When the stock has steeped for one hour, the bath is let down, the material being then given two cold rinses. If it is then found that decolorization is insufficient, the operations just outlined are repeated.

In a case where hydrosulphite is chosen as the decolorizing agent, the stock is first soaked in cold water for 24 hours to remove the looser class of impurities and then a liquor containing 10 to 15 lb. of hydrosulphite per 100 gal. of water is prepared in a separate kettle connected by piping to the other one. The solution of hydrosulphite is then run in at a temperature of about 85° F., circulation of the liquor being kept up for 20 minutes or so by means of a rotary pump attached to the apparatus. After this period has elapsed, steam is turned on and the kettle is raised to about 170° F. and maintained at this temperature for from 1 to 4 hours. If the stock is heavily colored with natural pigment, further amounts of hydrosulphite are added to the kettle from time to time. When decolorization is deemed sufficient, the bath is let down and the stock is well rinsed in cold water.

Some manufacturers of coir mats prefer to decolorize the stock in the woven condition. In this event, the mats are either strung on rods which rest upon the rim of the kettle or else they are processed in a package apparatus. This is of an extremely simple type, it consisting of little more than an open kettle fitted with a rotary pump for circulation purposes. It is customary to place a wooden trammel or grid on top of the pack to circumvent floating of the stock due to the formation of steam pockets.

Bleaching Vegetable Fibers
German Patent 615,680

Steep for 10 minutes in hot water and then place in bath containing 2.2 g. active chlorine and 1.5 g. caustic soda per l. at 32° C. Raise temperature to 75° C. and treat with hydrogen peroxide, then rinse.

Bleaching Mohair Cotton Fabric

The cloth, which is first thoroughly scoured in a soap soda ash bath, is transferred to a winch containing 500 gal. of water at 100° F. Five lb. of potassium permanganate carefully dissolved in lukewarm water are slowly added through a fine sieve. The cloth is run in this bath for 1½ hours. After two cold 10-minute rinses the box is filled to the same height as before with cold water and 4 gal. of 72° Tw. sodium bisulphite liquor are added. The cloth is run several minutes before adding 12 lb. of commercial sulphuric acid previously diluted by pouring into several times its volume of cold water. The cloth is run in this bath for 2 hours. A wash in a bath made slightly alkaline by adding trisodium phosphate, followed by a thorough rinse completes the process. It is sometimes necessaary to add a small amount of Acid Violet, Color Index No. 698, to the last rinse to obtain the bluish white which is usually requested.

Potassium permanaganate also has a limited use in producing novelty effects on shoe plush. The shoe plush after a good scour is dyed brown by running in a bath containing 30 lb. of permanganate per 825 gal. of water at 120° F. for 1½ to 2 hours. An addition of 5 to 10 lb. of potassium permanganate is usually necessary to obtain the desired depth of shade. Following the dyeing the cloth is rinsed at 160° F. with water made slightly alkaline by adding 1½ lb. of trisodium phosphate. Two warm rinses complete this part of the process. The novelty two-colored effect is obtained by using a brush tipping machine. The latter is essentially a one-color printing machine which uses a brush roller instead of an engraved roller. The pile is tipped with an acidulated solution of hydrogen peroxide. If nothing more is added to the tipping liquor a brown pile with a lustrous white tip is obtained. By adding certain basic and acid colors not affected by the peroxide beautiful blue, green and rose tips over a brown base are obtained.

A gray, varying in intensity from a light rabbit's fur color to a jet black, can be substituted for the brown at the base of the pile. The depth of the gray is directly proportional to the depth of the manganese brown originally on the fiber. It is accomplished by immersing the cloth after the tipping treatment in a cold bath containing .5 to 12.5% aniline salt and .25 to 12.5% sulphuric acid, depending on the depth of shade desired. It is worked in this bath for 30 minutes. A weak ammonia rinse and a thorough wash completes this process.

The above principle—aniline black over manganese brown—is sometimes utilized to obtain clear white discharges on woolen fabrics.

Bleaching Yarns, Skins and Straw
U. S. Patent 1,966,915

One hundred grams of woolen yarn may be placed in a solution of 1000 cc. of methyl alcohol in which 30 cc. of hydrogen peroxide (30% water solution), are incorporated. As the oxygen of the hydrogen peroxide is liberated much more freely in an alkaline solution, there should also be added about 2 cc. of, preferably, concentrated ammonia water. The solution containing the yarn should be heated to about 60° C. for about 8 hours.

The pelt is put into a bleaching liquor of about 1000 cc. of ethyl alcohol containing about 15 cc. of hydrogen peroxide (30% water solution), about 0.3 cc. of concentrated ammonia water, and about 45 g. of Turkey red oil. The skin is allowed to remain in the bleaching liquor for 24 hours at about 18° C. The skin thus treated exhibits perfect bleaching and the complete absence of injuries or impairments.

Pandan "stumps" are treated with a 1000 cc. ethyl alcohol solution containing 35 cc. of hydrogen peroxide (30% water solution) for about 6 hours, at about 60° C., and are then finished in the usual way. The bleaching proceeds very smoothly because the chlorophyl is extracted by the alcohol.

Natural Finish for Calico

Potato Starch	5	lb.
Wheat Flour	7½	lb.

are boiled with

Water	250	lb.

then add

China Clay Paste	10	lb.

and

French Mineral White	10	lb.

Boil and add

Coconut Oil	¾	lb.
White Soap	½	lb.
Carbonate of Soda	¼	lb.
Water	3	lb.

Add to a vat containing

Potato Starch	15	lb.

and

Water	75	lb.

Stir thoroughly and then slowly add

Potato Starch	5	lb.

and

Water	5	lb.

with a trace of ultramarine.

The starched goods are dried in a dry room, damped and rolled under pressure.

Alizarine Lake
Formula No. 1

Sulphate of Alumina (Tech. 18% Al_2O_3)	972 lb.
Water	10,000 lb.

No. 2

Soda Ash	500 lb.
Water	5,000 lb.

Filter both solutions.

Add the hot soda solution slowly to the hot alumina solution while stirring, keep boiling gently until the precipitate begins to be glassy, wash with clean water free from iron until, by repeatedly decanting, a sample of the wash water shows but very little turbidness with chloride of barium solution. The alumina now obtained by filtering may be used at once for making alizarine lake. The weight of the paste filtered into the bag amounts to about 7000 parts. Add to the alumina paste a solution of 144 parts calcium chloride anhydrous, chemically pure, in 500 parts water, and follow, while stirring well, with a solution of 84 parts phosphate of ammonia (pure neutral salt) in 500 parts water. Then stir in 150 parts ammonia Turkey red oil, which has been previously dissolved in a little water, and finally add 1000 parts Alizarine Red 1B extra (20% paste).

Either boil this preparation for 6–10 hours in an open vessel, when the evaporated water must be replenished, or treat for 1 hour in the autoclave with about 59 lb. pressure.

Alizarine Cyclamine is affected by metals including copper, and for this reason should not be steamed in the autoclave; lead vessels, however, may be used without risk.

Every substance used in the making of

madder lakes, including the water, must be free from iron.

Alizarine Dyeing of Silk

a. The well cleaned silk is entered, worked and steeped over night in a cold bath of basic aluminum sulphate prepared by dissolving 17½ oz. aluminum sulphate, free from iron, in 1 gal. of water to which 4 oz. soda crystals dissolved in a pint of water is added, the clear solution showing 12–15° Tw. The silk is wrung out from the mordanting bath, rinsed well, then fixed for half an hour in a cold bath of sodium silicate of 1° Tw. and finally rinsed very thoroughly. A basic aluminum salt is thus obtained on the fiber without injuring any of the properties of silk. The mordanted silk is then dyed with alizarine paste, the quantity of alizarine used depending upon the depth of the shade to be dyed, in a boiled off liquor bath broken with acetic acid, entering and working it in the cold for half an hour, gradually raising it to the boil in 1 hour and dyeing at that temperature for another half an hour. The dyed silk is then thoroughly washed in water, brightened in a weak bath of acetic acid and finally dried. The silk is dyed bright red.

b. Silk after being properly cleaned is entered, worked and steeped overnight in a cold bath of "nitrate of iron"—basic ferric sulphate—32° Tw. It is wrung out the next morning from the mordant bath, rinsed well in water, then fixed by working for half an hour in a cold bath of sodium silicate of 1° Tw. and finally rinsed very thoroughly in water. This mordanted silk is dyed with alizarine as usual. This gives a bright violet color.

c. As chrome cannot be used with advantage on silk as with wool, on account of its tendency to destroy the luster and injure the fiber, the mordanting is usually done with chromium chloride or chromium sulphate. The well scoured silk is worked and steeped overnight in a cold bath of basic chromium chloride 32° Tw. The next day the excess liquor is squeezed out, the mordanted silk is well washed in water, fixed for half an hour in a cold bath of sodium silicate 1° Tw. and finally rinsed very thoroughly. A basic chromium salt is thus obtained as a mordant on the fiber without particular injury to any of the properties of silk. The mordanted silk is then dyed in a boiled off liquor bath broken with acetic acid as usual. The dyed silk is thoroughly washed, brightened with acetic acid and dried. Silk is dyed a bright chocolate color.

Chrome Dyeing

Formula No. 1

Chromium Black	7 kg.
Acetic Acid	4 kg.

Heat to 100° C., boil ½ hour, add:

Formic Acid	1 kg.

boil another ½ hour, add

Potassium Bichromate	1.5 kg.

at a temperature of 70° C., then go up to 100° C., and boil ½ hour.

No. 2

Chromium Blue	4 kg.
Acetic Acid	5 kg.
Glauber's Salt	10 kg.

Heat to 100° C., boil ½ hour, add

Formic Acid	2 kg.

boil ½ hour more, add

Potassium Bichromate	1.5 kg.

at 70° C. up to 100° C., boil ½ hour.

No. 3

Chrome Flavin	2 kg.

Additions, method as in No. 2.

Vat Dyeing

Formula No. 1

Vat Scarlet HN-Process, 50–55° C. "One bath" process.	4 kg.

Fundamental Vat

Dyestuff	1 kg.
Water	30 kg.
Caustic Soda (40° Bé.)	1 kg.
Hydrosulphite	1 kg.

Dyeing Vat

Glue	3 kg.
Ammonia	3 kg.
Hydrosulphite	2 kg.

Dye ½ hour at 50–55° C.

No. 2

Vat Scarlet HN-Process, 50–55° C. "Two bath" process.	6 kg.

Fundamental Vat
As in No. 1.

Dyeing Vat
As in No. 1.

Dye ½ hour at 50–55° C., then add 2% hydrosulphite for the second (application), dye another ½ hour at 50–55° C.

No. 3

Vat Black	2 kg.
HN-Process at 50–55° C.	
"One bath" process.	

Dissolve the solid vat (küpe fest) in the same amount of boiling water, adding 5% (of the dyestuff weight) glue and the same of hydrosulphite.

Dyeing Vat

Glue	3 kg.
Ammonia	3 kg.
Hydrosulphite	2 kg.

Dye ½ hour at 50–55° C.

No. 4

Vat Black	12 kg.
HN-Process, 50–55° C.	
"Two bath" process.	

Solid vat solution (see No. 3).

Dyeing Vat

Glue	3 kg.
Ammonium Sulphate	4 kg.
Hydrosulphite	2 kg.

Dye ½ hour, then add:

Hydrosulphite	2 kg.
Ammonium Sulphate	3 kg.

Repeat dyeing ½ hour (second bath).

No. 5

Vat Blue	3 kg.
HW-Process, 60–65° C.	

"One bath" process.

Fundamental Vat (Stammküpe)

Caustic Soda (40° Bé.)	2.2 kg.
Dyestuff	1 kg.
Water	30 kg.
Hydrosulphite	1 kg.

Dyeing Vat

Glue	3 kg.
Ammonia	3 kg.
Hydrosulphite	2 kg.

Dye ½ hour.

Dyeing Formula for Acetate Rayon Velvet

Formula No. 1

Substantive Dyestuff	2 lb.
Glycerin, Dynamite	4 lb.
Condensed Water	2 gal.
British Gum Thickening	6 gal.
Caustic Soda, 75° Tw.	1 gal.

The following is an example of a print color for acetate rayon velvet.

Basic Color	1 lb.
Acetic Acid (30%)	20 lb.
British Gum or Senegal Thickening	8 gal.

A proportion of tannic-acetic acid, 1:1 improves the fastness to washing, in deep shades

The following is an example of a formula for a print color containing tannic acid:

Basic Color	2 lb.
Acetic Acid, 30%	15 lb.
Acetine	1½ lb.
Water	5 gal.
British Gum	18 lb.
Tannic-Acetic Acid 1:1	10 lb.

The last named ingredient should be added only when the color has become cold.

After steaming, the pieces are treated for a few minutes in a lukewarm bath charged with 12 oz. of tartar emetic per 10 gal. of water. This operation is commonly performed in a star machine, but it may also be carried out in a winch apparatus where the more robust velvets are being handled. After being treated with tartar emetic, the batch is given a light rinse in cold water, after which the pieces are hydro-extracted.

Vat Printing Color

Paste Vat Color	10 lb.
Glycerin, Dynamite	3½ lb.
Carbonate of Potash	14 lb.
Sodium Formaldehyde Sulphoxylate	7 lb.
British Gum Thickening	7 gal.

The following recipe for a color for the brush printing of viscose rayon plush will furnish an indication of the proportions of substantive dyestuff and other ingredients used in preparing the print colors:

Diphenyl Brown BBN Extra	8 oz.
Direct Orange G	3 oz.
Chrysophenine G	8 oz.
British Gum (Dry)	8 oz.
Glycerin	10 oz.
Phosphate of Soda	12 oz.
Condensed Water	1 gal.

Wool Dyeing

Indigo (20% Paste)	10 lb.
Water	2.4 gal.
Sodium Hydrosulphite (Powder)	2.5 lb.
Caustic Soda (76° Tw.)	6 pt.

The indigo and the water are intermingled first. To this mixture, the sodium hydrosulphite is added, gradually and with unceasing stirring. Finally, the caustic soda is introduced. The mixture is to be frequently stirred and its temperature maintained at 60° C. In about two hours, complete reduction may be expected.

Indigo Fermentation Vat

Formula No. 1

Indigo (60%)	20– 40 lb.
Woad	560–1120 lb.
Bran or Sharps	30– 40 lb.
Madder	10– 15 lb.
Lime	12– 25 lb.
Water	3240 gal.

No. 2

Water	2160 gal.
Woad	5 cwts.
Natural Indigo (Paste)	20–40 lb.
Bran	5 buckets
Madder	6 lb.
Lime (In Slaked Form)	3 gal.
Lime (In Slaked Form)	as directed

The water is run into the vat and raised to the temperature of 135° F. The woad is now added and the liquor stirred several times till "pasted." The 3 gal. of slaked lime are stirred in and the whole left over night.

A representative British hydrosulphite vat for wool may be made up in accordance with the following tabulation:

Water	1080 gal.
Ammonia (25%)	3.6 pt.
Hydrosulphite Powder	2 lb.
Glue Solution (1:10)	2.4 gal.
Indigo Solution (20%)	2.4 gal.

The water is run into the vat and the temperature brought up to 120° F. The indigo solution is stirred in.

At the beginning of each dyeing operation, add ammonia, hydrosulphite powder and indigo solution. At the end of the day's run, add a little glue solution and 1.2 qt. of caustic soda (at 76° Tw.).

Printing of Animal Fibers

U. S. Patent 1,962,601

Colored patterns fast to washing, light, perspiration, etc., are obtained by printing prechlorinated wool and silk with a thickened paste containing Indigosol, Leucosol, or similar water solvent derivatives of vat dyes and sodium nitrite, then steaming with wet steam at 99–100° C. for 7 minutes, and passing the fabric in open width through dilute sulphuric acid (50 g. [density 1.53] per l.) at 95°, followed by washing and oxidation with a solution at 35–40° containing (per l.) 1.5 g. of sodium persulphate and 2 g. of sulphuric acid (density 1.015) for 20 minutes.

Dyeing Aged Black on Piece Goods

The following is suggested: 120 lb. aniline salt, 10 lb. aniline oil, 35 lb. sodium chlorate, ½ lb. copper sulphate, per 100 gal. liquor.

The goods are impregnated with this solution, aged and chromed.

The following is another method of dyeing an "ungreenable" aged black. Two solutions are prepared:

a. 55 gal. of water, 45 lb. aniline salt, 13½ lb. toluidine, 7 lb. acetic acid, 18½ lb. sodium chlorate.

b. 18½ lb. nitrate of iron, 76.6° Tw., 6 gal. water, 27 lb. of a solution of copper sulphate (2:10).

Mix 8 gal. of *a* with 1 gal. of *b*, and pad with this mixture. Age and develop as usual.

The following process is also recommended: The pieces are padded with the following solutions, which are prepared separately, mixed when cold, and made up with water to 100 gal. The padding liquor should stand at 12° Tw.; 120 lb. aniline salt are dissolved in 26 gal., 3½ pt. water; 5½ lb. copper sulphate are dissolved in 10 gal. water; 37 lb. 9½ oz. sodium chlorate are dissolved in 7 gal. 3½ pt. water; 4 lb. ammonium chloride are dissolved in 2 gal., 3½ pt. water; to this are added 4 gal., 6½ pt. aluminum acetate, 15° Tw.

The cloth should be impregnated in such a manner that it retains about its own weight of padding liquor.

After impregnation, the cloth should be dried as rapidly as possible at a low temperature, after which it is aged for 1 to 2 hours at a temperature of 92° to 96° F.

The aging is followed by chroming and soaping.

Cotton Printing Paste

Victoria Blue B	6 oz.
Methyl Violet 4B	½ oz.

dissolve in

Acetic Acid, 40%	½ gal.
Starch Thickening (1 lb. Wheat Starch/1 gal.)	5 gal.

when cold add

Tannic Acid (4 lb./1gal.)	½ gal.

Crimping Cotton

Beautiful effects may be obtained by printing on a Gum Resist and subsequently passing the cloth through strong caustic soda. The dry content of the gum used as a resist is very important. A very highly converted British Gum is usually used and the strength will run 3–4 lb. per gal.

The greater the dry content of a gum

resist, the more effective is its power to resist the caustic soda. The latter will vary in strength from 25 to 30% according to the length of time the cloth is let lie after immersing and squeezing and prior to washing out. For best results it is advisable to select a light weight cotton cloth and print a design that is largely composed of lines running parallel to the selvage of the cloth. The reason for this is that the shrinkage, for the most part, takes place in the warp. After printing, run the cloth through the strong caustic soda in a pad box and let set 1 to 2 minutes. Finally rinse well with cold and hot water, hydro-extract and dry in a crepe dryer. In dyeing grounds for this type of work it is best to select colors that will not be affected by the caustic soda. If crepe dyeing is possible then beautiful two-toned effects may be obtained by dyeing the cloth after crimping.

In dyeing the latter, the dyestuff will have much more affinity for that part of the cloth that has been attacked by the caustic and as a result this portion will come out much heavier. Other effects may be obtained by selecting printing colors that will develop in a steaming operation and that will work well with the Gum Resist. These colors are printed on with the Gum Resist and then steamed, padded with the caustic and finished as mentioned above. The final result is a crimp in the colored or printed portion of the cloth. By selecting dyed grounds that may be discharged it is possible to obtain a crinkle in the white portion of the cloth. A discharge is made up with the Gum Resist and upon printing and steaming, the color is discharged at the printed part. After running through the caustic soda and finishing as mentioned above, it will be noted that the crimp is in the white portion of the cloth whereas the colored portion is uncrimped.

Lacquer Printing of Cloth with Metallic and Pigment Colors

This type of work is largely being carried out on silk, rayon and celanese where excessive handling is to be avoided. The advantage of this type of printing is in the fact that finished goods may be printed, dried and shipped without any intermediate process of steaming, washing, etc. The colors are really in a sense painted on the cloth and the secret of the success of this type of printing lies chiefly in the softness of the resultant print. Formerly bronze and pigment prints were extremely harsh when printed by this method but today the lacquers used have been highly developed and the prints are much softer in feel. Both cellulose acetate and nitrocellulose lacquers are used and the difference between the two is very slight as far as the resultant print is concerned.

Bronze or metallic prints are nowheres near as fast as the pigment class of colors. They tend to go dull on standing and will wash out in time. Pigment colors are extremely fast and will even stand a good rubbing. In order to do a perfect job, the engraver, printer and colorist must work together. The engraving is very important as too shallow a depth will make the color stick-in. The colorist must have the proper amounts of solvents in his printing paste, so that the paste will not dry too fast in the engraving. The printer must run at a uniform speed so that the paste as worked out by the colorist will give even results. Too fast a drying paste will make the color stick in, whereas too slow a drying paste will not dry fast enough over the dry cans. A nitrocellulose lacquer can be made by dissolving the dry nitrocellulose in a mixture of acetone and ethyl or methyl acetate. A cellulose acetate lacquer can be made by dissolving the dry substance in a mixture of alcohol, phenol and solvent naphtha. In using pigment pastes it is advisable to have them extremely finely ground in some solvent, such as acetone together with olive or castor. Proper grinding requires special equipment and this treatment is very essential for the best results.

Aniline Black Printing Paste

Yellow Prussiate of Potash	8 oz.
Chlorate of Soda Crystals	5 oz.
dissolved in	
Hot Water	2 pt.
and added to	
Aniline Salt	12 oz.
previously dissolved in	
Hot Water	1 pt.
and stirred into	
Starch Tragacanth Thickening Printing Paste	5 pt.

Silk Printing Pastes

Formula No. 1

Five pounds of good white starch and 5 lb. of white dextrin are mixed with 1 gal. of water, 7½ lb. of acetic acid of 12° Tw., 2 lb. of olive oil and 2½ gal. of water are then added, and the whole

boiled into a paste. This will suit almost all colors.

No. 2

Five pounds of good white starch are mixed with 1 gal. of water, and 2½ lb. of pale glue previously dissolved in 2½ gal. of water are added, and the whole boiled up to a paste. After allowing to cool, add 5 lb. of acetic acid 7° Tw., and 2 lb. of olive oil.

Textile Printing Pastes

Formula No. 1

Wheat Starch Thickening

Wheat Starch	12	oz.
Water	6	pt.

Boil and add

Chlorate of Potash	6½	oz.

When dissolved add

Yellow Prussiate of Potash	8	oz.
Aniline Salt	12	oz.
Aniline Oil	½	tumbler
Printing Paste	1	gal.

No. 2

Copper Sulphate Black for Block Prints (Thickening)

Chlorate of Soda	5	oz.
Copper Sulphate	2½	oz.
Wheat Starch	5	lb.
Water	4	gal.

Boil together and when thickened add

Gum Tragacanth	1	gal.

Boil further until an even texture is produced, cool and make up to

Printing Paste	8	gal.

Use 7 parts of thickening to 1 of aniline hydrochloride.

Silk Printing Color Resist

Rosin	650 lb.
Yellow Wax	50 lb.
Spermaceti	30 lb.
Suet	18 lb.
Paraffin	25 lb.
and	
Turpentine Oil	250 lb.

are heated together until they form a thoroughly liquid mass.

This resist is printed on lukewarm either in the printing machine with very deeply engraved rollers, or by hand printing. For the latter purpose the above mass must be kept a little thinner by the addition of a little more turpentine oil.

After printing, the goods are sprinkled with fuller's earth, and then hung up for a few days at the ordinary temperature. When the resist is dry, the goods are washed in cold water and dyed in a cold bath.

Fancy Textile Printing "Resists"

The following is a good and simple formula generally used by textile printers. It washes with water.

Formula No. 1

English Drop Black or Lamp Black	¼ oz.
Paraffin Oil	enough to make into a paste

Amalgamate the above thoroughly and add:

Tincture of Green Soap	4 oz.

mix and add:

Concentrated Lye Solution	5 drops

Stir vigorously and keep in well corked bottles.

No. 2

Japan Color	½ oz.
Raw Linseed Oil	1 oz.
Boiled Linseed Oil	½ oz.

Washes off with oil solvents.

No. 3

Powdered Castile Soap	1 oz.
Hot Water	2 oz.

dissolve thoroughly and add show card color.

White Resist for Sulphur Dyes

British Gum	200 g.
Water	250 g.
Zinc Chloride	400 g.
Water	150 g.

Heat until the gum and salt are dissolved.

If the resist white is found to run when printed with heavily engraved rollers, it may be improved by the addition of 75 to 100 g. China clay per kg. of color: as a rule, however, this addition is not necessary with ordinary patterns.

Cotton Yarn Dye Resist

If cotton is first impregnated with a solution of tannic acid overnight, squeezed in the morning, and then immersed in a bath of stannic chloride, it takes on the property of resisting many dyes. Use about 3 lb. of tannic acid (on 100 lb. of cotton yarn), and fix in a bath containing 2½ lb. of stannic chloride crystals. This tannic acid bath is used hot at the time the cotton is entered, but is cold by morning. The tin bath is used cold.

Wax Resist for Woolen Yarn

Rosin	60 lb.
Yellow Beeswax	5 lb.
Mutton Suet	2 lb.
Spermaceti	3 lb.
Paraffin Wax	2 lb.
Turpentine	4 lb.

The above are heated together and the resulting paste is printed on the goods. Strew with fuller's earth to prevent sticking, and when dry, wet out the skeins in cold water and dye in a cold or lukewarm bath with the required acid color.

Acid and Alkaline Resistant Treatment for Wool

U. S. Patent 1,964,934

Sulphite Cellulose Waste Liquor (Lime Free)	90 oz.
Magnesium Chloride	10 oz.

Stripping Sulphur Colors from Mixed Fabrics

A simple and yet very effective way of stripping sulphur colors on cotton in the presence of wool or worsted is as follows:

Prepare a cold bath of ½° Tw. chloride of lime. Run the cloth full width in this bath for 30 minutes. Then drop the bath and rinse thoroughly with cold water. A second bath containing ½° Tw. commercial hydrochloric acid is now made. The cloth is run in this bath for 20 minutes at 160° F. and then rinsed thoroughly. The excess acid is finally neutralized by a run in a lukewarm ⅛% soda ash solution. A final light soap scour completes the process.

The chemic treatment should destroy practically all the sulphur dyestuff inside of 15 minutes if the chemic is freshly made. When old chemic solutions are used longer running or a stronger bath is necessary. The hydrochloric acid treatment removes any residue of rust or sulphide spots left from the chemic treatment. The resulting cloth is usually a light cream color which the soap scour makes considerably lighter. The wool is chlorinated slightly by this method and has an increased luster and a greater affinity for dyestuffs.

Hydrosulphite Discharge on Indigo Ground

The printing paste is prepared as follows:

Hydrosulphite NF Concentrated	125–200 lb.

are stirred into

Hot British Gum Thickening	655–580 lb.

and after cooling

Zinc White Paste 1:1	150 lb.
Anthraquinone Paste 30%	50 lb.
Acetine (Neutralized with Soda)	20 lb.

are added.

The amount of hydrosulphite in the discharge depends upon the depth of the indigo shade.

After printing, the goods are well dried and then steamed for 3 minutes at 216–218° F. in the Mather-Platt, which must be free from air. The washing of the steamed goods is best carried out at full width in the washing machine in a boiling bath containing 10 parts silicate of soda 66° Tw. to 1000 parts water and 3 parts formaldehyde 40%. The passage through the washing machine should take three-fourths to one and a half minutes and the goods then well rinsed.

Instead of washing with silicate of soda, quick-lime (5 parts per 1000) or caustic soda solution may be used, although the silicate has the least effect on the indigo bottom.

It is advisable to steam and finish the printed goods as quickly as possible, but if this cannot be done immediately, the material must be protected not only before but also after steaming against moist air by winding rolls and keeping in a warm dry room 85–100° F. After steaming the white is cleared as above by passing the pieces through an alkaline bath.

Although the indigo is readily converted into a leuco-compound by hydrosulphite, still the discharged places are apt to show a bluish tint if the reduced compound is not completely removed from the printed parts, or if the indigo-white is partly reoxidized to blue before the steamed pieces are washed. The addition of anthraquinone to the printing paste aids the discharging effect of hydrosulphite and prevents the indigo-white from being too quickly reoxidized.

Crease Proof Fabric

British Patent 424,535

Ammonium sulphocyanide in the presence of variable quantities of urea has the advantage of requiring a comparatively low temperature for its formation. In previous similar processes it has been found necessary to heat the resin mixture for several minutes at 160

to 180° C. in order to produce full polymerization, but with these new resins a treatment of one minute only at 120° C. is sufficient; the textile material being treated is thus less liable to impoverishment.

The following is an example of the manner in which viscose rayon fabric is given a good feel and made uncrushable: First a solution is prepared with the following ingredients:

30% Formaldehyde	900 lb.
Urea	300 lb.
30% Ammonium Sulphocyanide Solution	150 lb.
Water	900 lb.

The fabric is impregnated with this liquor, squeezed free from excess, and then dried. Afterwards the fabric is led over rollers heated to about 130° C. and the impregnated substances then react to form an elastic insoluble resin which makes the viscose fibers practically uncrushable.

It is possible to use an ammonium sulphide instead of the more expensive sulphocyanide and also to color the fabric during impregnation with the resin components. Thus viscose rayon fabric is impregnated with the following liquor:

30% Formaldehyde	900 lb.
Urea	300 lb.
30% Ammonium Sulphide	150 lb.
Sulphonated Cetyl Alcohol (Wetting and Dispersing Agent)	60 lb.
Ammonium Sulphocyanide	50 lb.
Diamine Sky Blue FF	20 lb.

and then dried at 150° C. for 10 minutes.

Crease Resisting Fabric
U. S. Patent 1,980,676

Fifteen gallons of casein solution containing 1 lb. of dry casein and 2 oz. of trisodium phosphate are mixed with 5 gal. of 30% latex solution containing 2% zinc oxide on the dry rubber and 2% piperidine penta-methylene dithiocarbamate. The latter material acts as an accelerator for the rubber. An ordinary sizing mangle can be used, the excess size being removed and the fabric is then dried. Subsequently, the fabric is washed in boiling soap solution to remove that part of the size which held the latex in suspension, presumably the casein component. In order to prevent the crossed yarns from adhering to one another, work the fabric during the drying operation which is the method employed in the acid organdie process for the same purpose.

Delustering Finish for Rayon

1. Fuller's Earth	50 lb.
2. Titanium Dioxide	40 lb.
3. Sulphonated Castor Oil (30%)	150 lb.
4. Stearic Tallow Softener	15 lb.

Mix 1 and 2 and wet out with 3. Then add 4 and grind well.

Degumming and Decolorizing for Straw
British Patent 424,189

Soda Ash	80 lb.
Rosin	80 lb.
Casein	250–300 lb.

Water to give consistency of soft soap while being heated.

Renovating Surfaces of Textiles
British Patent 419,856

The shine produced on textile fabrics by wear can be removed if the fabrics are first dry-cleaned, the surface fibers raised by teazelling, and then a mixture of 1 part sodium salicylate, 2 parts borax, 1 part cresol saponatis, and 3 parts ammonia in 320 parts water applied; finally the goods are brushed thoroughly.

Mercerizing Wetting Out Agent
U. S. Patent 2,008,458

Cresol, Technical	90 lb.
Aniline	10 lb.

Mercerizing
German Patent 606,025

As wetting agents for use in mercerizing lyes, use is made of acid esters of phosphoric acid in association with phenols and (or) highly sulphonated oils. A typical wetting agent comprises dibutyl phosphate 1, crude cresol 9 and a highly sulphonated oil 2 parts by weight.

Low Luster Artificial Silk
U. S. Patent 1,967,206

Casein	10 lb.
Water	200 lb.
Turpentine	10 lb.
Petrolatum	10% of weight of cellulose

The above is emulsified and added to the spinning solution (viscose).

Partially Saponifying "Celanese"

To dye directly and uniformly with certain dyes, it is often necessary to par-

tially saponify "Celanese" by padding with the following and drying.

Soda Ash	30 lb.
Glycerin	2 gal.

After drying, steam for 4 minutes in a rapid ager. Rinse well and dye with any direct dyestuff.

Restoring Luster to "Celanese"

Pad with 28% acetic acid, tenter and dry under tension. Rinse well and dry.

Rejuvenating Cloth
U. S. Patent 2,006,192

A composition suitable for treating worn shiny wool or silk fabrics is formed of alcohol 16 oz., 24% ammonia solution 3 oz., glacial acetic acid 4 oz., oil of lavender 1.5 g. and chloroform 2 oz.

Cotton Softener

a.	Tallow	4 g.
	Caustic Potash (50° Bé.)	1.2 g.
b.	Water	6–7 g.

When *a* is saponified, add *b* with stirring and stir until solidification begins.

Pre-Shrinking Treatment of Cotton Fabrics
U. S. Patent 1,959,406

Cotton fabric is shrunk by immersion for 1–10 hours in an aqueous liquor at 65–100° containing 1–4 oz. of ammonium alum and 0.25–3 oz. of sodium bisulphate per 10–50 oz. of water, followed by hydro-extraction (without intermediate washing) and drying.

Tarnish-Proof Cloth
U. S. Patent 1,933,302

The cloth after dyeing is dipped in a solution of a cadmium salt (0.5 lb. or gal.) e.g., cadmium acetate which absorbs hydrogen sulphide when used as a wrapping for copper and silver articles and thus protects them from atmospheric tarnishing.

"Cravenetting" Textiles

The process of waterproofing or cravenetting proper is not a simple one. Soaking the fabric in a strong solution of acetate of alumina for several hours, extracting and allowing to dry slowly, is about as effective as any simple process. The acetate of alumina may be prepared by dissolving 1 lb. of alum in 1 gal. of hot water. In another vessel containing ½ gal. of water dissolve 1¼ lb. of sugar of lead (lead acetate). Mix the two solutions and allow the precipitate to settle. The clear liquid only is used in preparing the bath, using about 1 qt. of the solution to 1 gal. of water.

Proofing Against Moth and Fungi
British Patent 413,445

Animal fibers such as wool, felt, fur, skins, feathers, silk and hair, are proofed against moth and fungi by treatment with a solution of chromium fluoride so that a definite quantity of chromium compound equivalent to 0.65% of chromium fluoride is retained by the material. After steeping or padding with the aqueous solution, excess is removed and the chromium compounds fixed on the fiber by drying at a temperature above 150° F. In British Patent 413,529, the process in the above specification is modified by adding antimony fluoride to the chromium fluoride bath.

Mould and Fungi Proofing of Textiles
British Patent 413,648

About 5% barium borate is claimed as an impregnant.

Silk Wool for Knitting

Silk-wool, suited for knitting, may be produced as follows: The woolen yarn is first treated for 15 to 30 minutes in a cold bath of 100 l. in which ¾ l. of hydrochloric acid (at 32° Tw. = 1.160 sp. gr.) has been dissolved. The yarn is now to be well drained or else hydro-extracted. A second cold bath is prepared by using the clear liquor from a solution of 1½ kg. of bleaching powder in 100 l. of water. The yarn is treated in this cold bath for perhaps 15 to 30 minutes. Afterwards the yarn is drained and then soured with hydrochloric acid for 30 or 45 minutes. Next, the work is to be rinsed and then turned for 15 to 30 minutes in a warm bath at a temperature of 75° C. (167° F.). This bath is to contain 600 g. Marseilles soap per 100 l. of water. The work is now removed and hydro-extracted. Afterwards, it is given a second souring with hydrochloric acid. Finally, it is well washed.

Felt Hat Stiffener

Carnauba Wax Emulsion (Bright Drying)	90 lb.
Shellac (Ammonia Water Solution)	10 lb.

Stiffening Material for Shoes
French Patent 777,404

The material is made by impregnating cloth, paper or felt with a colloidal substance, a part of which is in the precipitated state and consequently easy to dissolve while the rest is not precipitated and therefore less easy to dissolve. Thus, flannel is impregnated with a colloidal solution containing cellulose nitrate 150 kg., alcohol 580, acetone 60, carbon tetrachloride 120 l. and then dipped in water for 15 minutes. A part only of the nitrate is precipitated and the material is air dried.

Rubber Latex as a Textile Finishing Agent

The use of rubber as rubber latex or in a dispersed form has found many applications of late in the textile industry. It is natural to assume that a substance possessing the characteristics of rubber, i.e., water repellency and its flexibility, and especially the fact that it may be applied to a textile in a liquid state like many other finishing compounds, should find development in the finishing of textiles.

The application of rubber latex in connection with textiles has been grouped as follows: For the production of artificial leather and non-skid rug underlaps; as a backing and sizing for pile fabrics, or binding and strengthening agent for fabrics that otherwise would be too sleazy for rough usage; for double texture fabrics. Hauser has discussed the use of latex in combination with canvas for friction belts, as well as its use as a binding agent for applying flocked wool or cotton to a fabric base.

The utilization of rubber latex in the carpet industry has assumed a rôle of importance as carpetings impregnated with it form their own selvedges without unravelling, thus obviating the necessity of a binding. Carpetings of this type may be joined together by use of a latex adhesive without any evidence of a surface seam. If the proper latex is used for the backing of the carpet, the latex is waterproofed to such an extent that it may be scrubbed on a floor without the moisture coming through. Rubber latex has been an important factor in developing a new type of construction in carpets and pile fabrics. In this process, a hair batt is laid on a latex-coated base and the fabric subjected to a vulcanizing process. In this particular development the use of looms for the production of the carpets has been done away with entirely.

It has been stated that it is obvious that the textile mill is not equipped to develop the various latex compounds required. A textile plant possessing the facilities of the average sizing and finishing equipment and laboratory will probably be in a position to develop rubber latex as a finishing agent.

Rubber Latex

The presence of rubber latex as a processing agent has been made possible because of developments in prolonging its stability. Crude rubber latex, when stabilized with ammonia immediately following tapping, will withstand reversion or coagulation for the interval of shipping time until it reaches its destination, where it is subjected to further stabilization with ammonia. The rubber latexes are white to grayish in color, and are found occasionally with a yellowish cast. Latex, when freshly collected from the tree, may contain as high as 50% rubber, but following stabilization the rubber content will drop usually to 40% and under. In a number of cases, before selling, it is concentrated by various methods, or is compounded for a particular need.

The concentrating of latex is carried out by various processes, which may be subdivided as follows: (1) by creaming promoted by centrifugal force much in the same manner as a cream separator; (2) by filtration through unglazed porcelain while the latex is kept in movement; (3) by evaporation after the latex is stabilized by a non-volatile stabilizer like soap or sodium alginate.

Water dispersions of rubber differ from latex in that the latter at no time in its processing has been reverted to the solid state, but has been kept liquid since its tapping from the tree. The water dispersion, on the other hand, is a stable dispersion of coagulated, smoked rubber, plus various compounding ingredients, effected by mechanical means. These have been marketed by a number of the leading rubber companies already compounded, and they exhibit properties similar to rubber latex towards other chemicals. They are usually less expensive than latex and greater efficiency may be obtained by their use because of the greater rubber concentration of the majority of dispersions when compared to the ordinary 40% latexes. Water dispersions of rubber usually yield softer films, but one of their drawbacks lies in that many of these are not as lightly col-

ored as rubber latex and consequently will not yield the latter's clear films.

Rubber Latex with Starch

Rubber latex may be incorporated with a starch sizing to add flexibility and water resistance when padded to a fabric. Crude latex in admixture with a starch sizing will not waterproof a fabric but it will enhance its water repellency. However, if a compounded rubber latex is used, waterproofedness will be produced.

Rubber latex in mixture with starch is used extensively today as an adhesive. The mixture is not an easy one to produce. This is due to the action of a starch paste, which, although it is itself a protective colloid, tends to coagulate latex when it is added in a hot state. The latex should be first protected with a protective colloid such as glue, casein or gum tragacanth. Bone glue has been found to be an excellent protective agent as well as one exhibiting properties akin to a starch.

One part of a better grade of bone glue is heated, while stirring in 8 parts of water, to 140° F. until all lumps have been dispersed, and a smooth thin paste results. The glue should not be heated to over 140° F. since a decomposition of the protein may result.

If the cooked glue is tested for acidity it will be found to be somewhat on the acid side. Any substance exhibiting an acid reaction should not be added to rubber latex as acidity will tend to coagulate it. Consequently the glue is made alkaline with 0.5% solution of caustic soda, and cooled to about 110° F. (Although precautions against the addition of caustic soda to latex have been advised, no deleterious effects from the addition of small amounts of it have as yet been noted.) The latex—four parts of latex to one part of glue by volume—is then further stabilized with a small amount of ammonia, and then poured slowly while stirring into the glue. Thus we now have the protected latex mixture.

The starch (maize cooked 1 lb. to 1 gal.—tapioca starch 8 oz. to 1 gal.) paste is cooled to 140° F. and an equal volume of water is added. This should be made alkaline with a small amount of ammonia; the protected latex mixture is added to it slowly and stirred until a uniform mixture results. If this size mixture is padded on to a cotton fabric, a firm, flexible finish will result. Thus in a like manner it may be thinned to yield the desired firmness.

In adding a protected latex solution to a cooked starch, care should be taken that the size should not be too hot—not over 140° F., since there is a liability of coagulation of the latex. Once a latex reverts or coagulates, there is little hope for its redispersion, since this may be carried out only with special equipment as that used for making water dispersions of rubber. However, there are certain indications of partial coagulation before a latex will completely revert. If, upon the addition of the protected latex to the starch, a sudden stiffening of the latter is noted, we have an indication that coagulation is setting in. No further addition of latex should be made, but the starch should be further thinned with ammoniated water until it thins out evenly, and then the remainder of the latex is added slowly.

A size-latex mixture as prepared above will produce a water-repellent finish on a fabric but will not waterproof it. To produce a waterproof finish, a "curable" or vulcanizable latex must be used.

Compounding Rubber Latex

In order to compound crude latex for vulcanization, there are certain essential chemicals which should be present in the mixture at all times. These are sulphur, zinc oxide, and an accelerator. Sulphur chloride may be substituted for sulphur. Any other chemicals added are for the purpose of lending some desired property to the resultant rubber film.

Any substance added to latex must be water-soluble and completely miscible with it, in order to produce effective results. Sulphur and zinc oxide in their dry state are not soluble in water and therefore cannot be incorporated into latex as such. Sulphur chloride is miscible with latex, but because of its cost and its irritating action on the skin should be disregarded. Thus the zinc oxide and sulphur must be placed in a water-soluble state before their addition to latex. This is done by placing them in a colloidal state, and they are marketed as colloidal sulphur and zinc oxides and capable of being thinned to a great extent with water before they fall out of solution. On a dry basis, the concentration of dry sulphur in the colloidal material is about 45% by weight, while the zinc oxide runs about 54% by dry weight.

The purpose of the sulphur in the mixture is to produce greater flexibility and toughness in the rubber film. To hasten this effect, zinc oxide is added. It may be termed a very slow accelerator in the vulcanizing or "curing" action of the sulphur on the rubber. However, to

hasten the reaction between the rubber and sulphur to a greater degree, a more rapid outside accelerator is invariably added as well. Water soluble accelerators are present on the market which will cause the rubber to vulcanize at a temperature of 140° F., and it has been noted that latexes compounded with these accelerators vulcanize at oven temperature. A simple starting recipe for a vulcanizable rubber mixture is:

Latex (50%)	1 gal.
Colloidal Sulphur (45%)	1¼ oz.
Colloidal Zinc Oxide (54%)	2 oz.
Accelerator	½ oz.

In preparing this mixture, the colloidal sulphur and zinc oxide are first thinned separately with a portion of the latex before their addition to the major portion. The accelerator is first pasted with a little sulphonated castor oil, and then thoroughly dissolved in a small amount of water at 150° F. The solution is then strained through a cheese cloth into the partially compounded latex. The latter is then stirred thoroughly to produce a uniform mixture.

If an accelerator which must be emulsified before adding to latex is used, it should be emulsified with triethanolamine and oleic acid as follows:

Accelerator	100 lb.
Oleic	5 lb.
Triethanolamine	2 lb.
Water	80 lb.

The accelerator and oleic acid are thoroughly mixed and added slowly while stirring to the triethanolamine diluted with the water. The amount of this emulsion added to the latex should be based on the actual weight of the accelerator present in a specific volume. For liquid accelerators, the dispersing of these in water with ammoniacal casein is recommended. An agitator must be used in order to obtain a stable dispersion. In order to prevent rubber films from oxidizing too rapidly, compounds called anti-oxidants are often incorporated into the latex batch. For the majority of water-soluble anti-oxidants used with latex, the amount used is about double the weight of accelerator in the formula. If this vulcanizable mixture is protected with glue in the same manner as the crude latex and then added to a size batch which is applied and dried into a fabric, a complete waterproof should result.

Care should be taken in drying fabrics impregnated with a starch-crude latex sizing on a can dryer. A crude latex film when subjected to heat has a tendency to become soft and sticky, thus tending to adhere to the dry cans. If the percentage of latex in the size batch is such that this occurs, the sticking may be overcome by powdering the cans with a small amount of talcum. With a tenter dryer, little difficulty should be encountered in this direction.

In coating fabrics with latex for adhesive purposes or for producing protective films, it is desirable that greater amounts of latex should be carried to the material. This is accomplished by use of a thickening agent on the same principle as the use of a thickener in printing fabrics. A more concentrated latex may be used alone since it is naturally creamy and thick. A natural 40% latex, however, must be thickened. Thickening agents include starch, water-soluble resins and colloidal clays. Where a coating is desired which overlooks the brittleness produced by the starch, then the latter should be used. Colloidal clays should be used when the natural flexible rubber films are sought. Much of the firmness as produced with a starch may be overcome by the addition of a softener such as sulphonated castor oil. If an excess of the sulphonated castor oil is used, tackiness in the crude rubber film results.

Of the clays, a good grade of colloidal bentonite makes an excellent thickening agent. A concentration of 1 lb. to a gallon of water in admixture with 1 gal. of crude latex yields a viscosity which produces continuous films having good body. To produce the clay paste, the dry bentonite should be first pasted with a small amount of sulphonated castor oil thinned with a portion of the subsequent water to be used. The remaining water is then stirred in and the mixture allowed to soak overnight for the lumpy clay to expand. On the following day the paste is thoroughly mixed and then strained through cheese cloth before its addition to be used. The remaining water is then stirred in and the clay will tend to dust when it is found present in the rubber film.

If it is desired that the film should be colored, an organic dye in solution may be added, but the greatest fastness is obtained by use of water-soluble dispersed colloidal pigments which are present on the market.

Films produced from crude latex mixtures, as pointed out previously, will tend to grow tacky with heat. If this condition is undesirable, a compounded latex must be used.

Wetting Agents with Latex

Recently, a number of wetting agents have been marketed especially for use with latex. These are of use when a thorough impregnation of a heavily woven cotton fabric is necessary. A wetting agent showing an acid reaction when in solution should be avoided. The best method of accomplishing a thorough impregnation of a heavy cotton fabric is first to boil it out thoroughly in soda and in a wetting agent, and after a thorough wash and nipping it should be run through a pad in open width containing the latex and wetting agent.

If the material is but wetted in water and the wetting agent added to the latex bath, then the high speed of the pad should be diminished. Instead, the cloth in open width is run very slowly through the latex in order to insure a thorough soaking, and then through the nip.

Precautions in Handling Latex

(1) There should be a word of advice to the workman handling latex, and this is that he should abstain as far as possible from placing his hands in the raw latex. The reason for this is that in many cases there is an acidic reaction from the perspiration on the hands which tends to cause reversions. Cases of latex coagulation have been reported due to this cause.

(2) Rinds and latex films that are noted on the surface of a latex bath should be picked off, since these hasten coagulation. If possible, when these occur, the bath should be strained through a cheese cloth to remove the films.

(3) Latex should not be subjected to abnormal conditions of temperature. Latex when frozen will coagulate when reliquefied, and consequently should never be stored in a spot where a low temperature of 32° F. may occur. Latex should not be heated as this will cause the stabilizing ammonia to volatilize, this condition tending to hasten coagulation.

(4) Latex mixtures should not be made in copper vessels, since if small amounts of copper are present in a rubber film the metal will tend to hasten the oxidation of the film.

(5) Latex should never be added to size baths containing calcium, barium, or aluminum salts, as these exert a coagulation action on latex.

Rubber latex has found a place for itself in the finishing of certain textiles. It can be handled properly with the finishing equipment of the average mill. The prime requisite is that the finisher familiarize himself with this somewhat new finishing agent.

Fireproofing Solutions

The following is the formula of a solution used in theatrical work for rendering materials non-inflammable:

Tungstate of Sodium	17½ oz.
Water	1½ pt.

Dissolve in the cold and add:

Sodium Phosphate	2½ oz.
Water	1 pt.

or a sufficiency of water to make the solution sp. g. 1.140.

Dip the material in the solution, wring out with the hands, dry, and iron if necessary.

The following are formulæ of solutions advised by the L.C.C. for rendering curtains, Christmas decorations, etc., non-inflammable:

Formula No. 1

Ammonium Phosphate	1 lb.
Ammonium Chloride	2 lb.
Water	1½ gal.

No. 2

Borax	10 oz.
Boric Acid	8 oz.
Water	1 gal.

Both solutions can be used for coarse fabrics, but No. 2 is better for more delicate articles. The fabrics should be dried without rinsing, and it is advisable to experiment with a small portion of the cloth before treating the whole, as the texture and colors of some materials are affected detrimentally.

Fireproofing for Canvas

Ammonium Sulphate	8 oz.
Ammonium Carbonate	2.5 oz.
Boric Acid	3 oz.
Borax	2 oz.
Starch	2 oz.
Dextrin	0.4 oz.
Water	100 oz.

Steep ½ hour at 86° F.; 2 dips necessary for best results.

Fireproofing Brake Lining

U. S. Patent 2,001,194

Brake lining is impregnated with a composition such as may be formed from an aniline dye 10 to 20 g., ammonium sulphate 60 lb., ammonium phosphate 10 lb., boric acid crystals 12 lb., gum acacia 2 lb., cresley ore 2 lb., barium hydroxide 4 lb., aqueous ammonia 1 qt., ammonium-aluminum sulphate 2 lb., copper-sodium

alginate 1.5 lb., benzaldehyde 1 oz., sodium bicarbonate 2 lb. and water 100 gal.

Flameproofing and Fireproofing Textiles

Sodium Borophosphate Resin (Abopon)	8 lb.
Water	5–6 gal.

Dip the textile into the above solution warmed to 110 to 170° F.; wring out and pass between warm rollers. This process gives a uniform coating which does not powder out like the usual fireproofing salts.

Waterproofing Canvas

Formula No. 1

A treatment that is sometimes given to awnings to waterproof them and still leave them flexible so they can be rolled up and down, is as follows: First apply a coat of glue size, made by dissolving 1 lb. of high-grade glue in 3 qt. of water. To 1 gal. of this size add 1 oz. of alum, previously dissolved in hot water. Apply the size while still quite warm, using a wide flat wall brush. When the size is dry apply two coats of a paint made by mixing white lead-in-oil, with necessary tinting colors added, thinned to rather stout brushing consistency with a liquid composed of 2 parts of boiled linseed oil and 1 part of turpentine. Be sure to use boiled linseed oil, as raw oil would have a greater tendency to rot the canvas, more especially if glue size has not been used under the paint. Two coats, or not more than 3 coats, should be sufficient. Be sure to allow ample time between coats for thorough drying. If the use of paint is objectionable, shave paraffin into gasoline, in the proportion of 2 oz. of paraffin to 1 gal. of gasoline, stirring until the wax is dissolved. The wax must be in very thin shavings to dissolve quickly in cold gasoline. As soon as the wax is dissolved, brush a coat of the solution on the bare canvas, using a wide flat wall brush. The next day another coat may be applied. If you brush the material on carefully you should be able to build up a reasonably smooth, waterproof surface in this way. Be very careful when using this preparation that no one strikes a match near you, and that there is no sort of flame in the room where you are using the solution, or you may have an explosion. One of these processes embodies the use of paint and the other a wax as the waterproofing agent, and either will leave the canvas reasonably flexible and waterproof.

No. 2

Canvas Waterproofing

Gilsonite	10 lb.
Asphaltum	2 lb.
Degras, Neutral	4 lb.
Beeswax Crude	1 lb.
Lead Oleate	3 lb.
Kerosene	31 lb.
Gasoline	41 lb.

Waterproofing Cotton Cloth

Pad the cloth with aluminum acetate solution (2° Tw.) and dry. Then immerse in sodium stearate "solution" (5%) at 120° F. Rinse well and dry.

Tarpaulin or Tent Waterproofing

Formula No. 1

British Patent 414,242

Paraffin Wax	3–5 lb.
Naphtha	200 lb.

Warm together on steam bath and mix until clear. Then mix in:

Aluminum Powder	5–20 lb.

No. 2

Australian Patent 17,598

Rubber Latex	1–2 lb.
Linseed Oil	½ lb.
Casein	2 lb.
Water	16 gal.

Water-Repellent Fabric

U. S. Patent 1,967,267

Fabric is impregnated with a solution of 1 pt. of wax (or animal and vegetable fats, greases, or oils) and 1 pt. of water shedding substance (e.g., cellulose acetate or nitrate, etc.) in an organic volatile solvent (e.g., ethyl acetate) and then dried, whereby it retains its original softness but becomes water repellent.

Textile Backing (Waterproof)

Latex (50% Concentration)	1 gal.
Casein	12 oz.
Water	1 qt.
Zinc Oxide	1½ oz.
Sulphur	⅝ oz.
Accelerator No. 552	½ oz.
Agerite White Powder (Anti-Oxidant)	⅝ oz.

Waterproofing Wool Goods

The simplest method of waterproofing wool goods is the application of metallic

salts and tannic acid, sold either as powder or crystallized, with or without previous or subsequent soap, or fatty acid baths.

Formula No. 1

For 100 l. of impregnation bath there is dissolved about 100 g. of acetate of lead, 200 g. of alum, and 100 g. of tannin in boiling hot water. The goods are passed at about 40° C., centrifuged, and dried at from 40 to 50° C. The effect of the impregnation process is considerably increased by the above-mentioned soap and fatty acid baths.

No. 2

Three hundred grams of the best sulphonated oil, and 100 g. of olive oil soap are stirred in 10 l. of boiling water. They are added to a bath of 90 l. water at a temperature of 50° C. and the goods are passed at 40° C. To simplify the procedure these two baths may be combined in one.

No. 3

One hundred grams acetate of lead, 200 g. alum, 100 g. tannin, 20 g. linseed oil, 500 g. Monopol oil, and 100 g. of pyridine are well stirred into about 20 l. of boiling water and brought to a boil again. Then the whole is increased to 100 l. by adding water of at least 60° C. The goods are passed at 40° C. and dried rapidly. Wool fat that can easily be emulsified is also well suited for the wet impregnating of wool. When it is used, the emulsifying is done separately.

No. 4

Ten kilograms of wool fat, 1 kg. ammonia, 5 kg. sulphonated oil, and 500 g. pyridine are brought to the boil in about 50 l. of water, the whole being well stirred. This suffices for an impregnating bath of about 800 l. Into this bath, before adding the emulsifying agent, there are stirred 500 g. of pyridine, and the temperature is brought to 50° C. The goods are dipped at from 30 to 40° C., centrifuged, and dried thoroughly. To make the impregnation more effective, there may be added to these baths tannin substances or metallic salts. The effect is always superior when they are used in separate baths.

Waterproofing Wool, Silk, Rayon and Cotton

Examples for impregnating fabrics and wearing apparel of wool, silk, rayon and cotton are as follows: In 100 l. of petrol or other volatile hydrocarbon solvent, are dissolved by stirring well, 1 kg. of linseed oil varnish and 2 kg. of ceresin, the latter first being melted. The goods are thoroughly dipped, centrifuged, and dried in the open air. Subsequent steaming gives further assurance of even and thorough impregnation throughout the fabric. Fabrics can be steamed on a wet pressing roller. With very light colored and with white goods, the best wool fat is used instead of the linseed oil, and white paraffin instead of ceresin. Wool fat is recommended especially for wool goods when a soft feel is to be preserved, since after the admixture of varnish, the goods grow harder with time. The varnish impregnation is particularly suitable for coarser goods for which very thorough waterproofing is desired, especially for tentings, army blankets, water pails, and for colored umbrella fabrics of all kinds of fibers.

Porous Cloth, Waterproofing

For this purpose a solution of acetate of alumina or acetate sulphate of alumina, which is prepared as follows, is chiefly used.

Sulphate of Alumina	665 lb.
dissolved in	
Water	600 lb.
Sugar of Lead	945 lb.
dissolved in	
Water	900 lb.

Dissolve each by itself hot, precipitate cold, draw the clear solution off and make to Twaddell 15°. In this manner a standard alumina sulphate-acetate is obtained of which the greater part is deposited on the fiber in drying.

As woolen and half wool goods still contain some soap from the milling process, a soap passage is as a rule not necessary before impregnating with alumina; otherwise the goods are passed through a weak soap solution (3:1000), squeezed and dried without rinsing.

The goods are impregnated on a hank washing or open width washing machine provided with pressure rollers, by passing the dry goods for 1 hour through the diluted acetate-sulphate of alumina of 3¾° Tw. (undried goods at 7½–15° Tw.). The goods are then slightly centrifuged without rinsing or squeezed and then dried.

For wool and half wool goods a single impregnation will suffice in most cases; if a higher grade of waterproof finish is desired the treatment is repeated, inserting a soap passage if necessary.

In place of acetate-sulphate of alumina, formate of alumina may be used

with advantage. The latter possesses the advantage over the former that the danger of the subsequent tendering of the cotton warp in half wool goods, due to the formation of sulphuric acid in the fiber, is eliminated. Formate of alumina is used in the same manner as acetate-sulphate of alumina.

Waterproofing and Fireproofing Fabrics, Paper, etc.

Austrian Patent 136,953

The material is coated or impregnated with an alcohol solution containing a resin, fat or like substance and a non-hydrolyzing salt of a metal of the 2nd periodic group which forms a colorless or transparent compound with the alcohol. A typical solution comprises resin 2, castor oil 0.5, crystalline zinc chloride 3, crystalline magnesium chloride 5, and 96% alcohol 12 parts. The solution may be applied to crepe paper.

Waterproofing and Flameproofing

U. S. Patent 2,003,148

A method of compounding a composition of matter for flame and waterproofing aqueous cellulose media and their derivatives comprises heating 640 parts of water to 120° F., adding 48 parts of ammonium sulphate and stirring until completely dissolved, adding 16 parts of ammonium carbonate incrementally under constant stirring until effervescence ceases, adding 20 parts of boric acid previously dissolved in 128 parts of boiling water, adding 16 parts of borax and thoroughly mixing, adding 16 parts of starch previously cooked to about 1° Bé. and thoroughly mixing in the same under constant stirring; dissolving 6 parts of suitable soap in 128 parts of water and bringing it to the boiling point, thereafter adding the same to the previously compounded materials, bringing about emulsification of the whole and then lowering the temperature to about 110° F. and digesting for about 2 hours thereby forming a first composition; bringing 640 parts of water to the boiling point and dissolving therein 80 parts of ammonium chloride, 48 parts of boric acid and 16 parts of borax in the order named, and each after the preceding has been completely dissolved, stirring the same thoroughly after all three have been added and dissolved, separately dissolving 32 parts of soft gelatin in 256 parts of water and heating to about 200° F. under constant stirring and thereafter optionally adding thereto 13½ parts of glycerin, stirring thoroughly and then adding the same to the ammonium chloride—boric acid—borax solution under constant stirring for about 30 minutes and then digesting for about 1 hour at about 140° F.; dissolving 3 parts of suitable soap in 128 parts of water, heating to boiling and adding 8 parts of dextrin, stirring such constantly to insure uniformity and then adding such to the ammonium chloride-boric acid-borax-gelatin solution, thereby forming a second composition; bringing 128 parts of water to the boiling point, dissolving therein 15 parts of soap bark and filtering, thereby forming a third composition; dissolving 32 parts of alum in 256 parts of water as a fourth composition; digesting each of the four compositions for about 4 hours while stirring from time to time; combining the first, second and fourth compositions in a common vessel and then adding the third composition under vigorous stirring.

Colloidal Textile Oil

Formula No. 1

Castor Oil	20 gal.
Coconut Fatty Acids	100 gal.
Caustic Soda Solution (30° Bé.)	15 gal.
Water	30 gal.

Manipulation: Mix in the order given at 40° C.

No. 2

Castor Oil	15 gal.
Coconut Fatty Acids	75 gal.
Water	22½ gal.
Caustic Soda Solution (30° Bé.)	11½ gal.
Paraffin Oil (28° Bé.)	82 gal.

Manipulation: Mix at 40° C.

Colloidal Olive Oil

Commercial Olive Oil	90 lb.
Caustic Potash Solution (32° Bé.)	13 lb.
Water	150 lb.

Manipulation: Stir the caustic potash solution into the olive oil at room temperature and allow to stand overnight. In the morning add the water (which is previously brought to a boil). The mixture is well stirred during addition of the water, which is added slowly.

Acetate Rayon Oil

Sulphonated Castor Oil (65%)	50 gal.
Commercial Olive Oil	45 gal.

Acetic Acid (28%)	20 gal.
Paraffin Oil (28° Bé.)	5 gal.
Water	100 gal.

Manipulation: Mix the three oils and the water at 40° C. Then cool to 30° C. and stir acetic acid into mixture slowly.

Hosiery Oil

Sulphonated Castor Oil (65%)	1000 lb.
Caustic Soda Solution (27° Bé.)	300 lb.
Water	650 lb.

Manipulation: Mix caustic soda solution with oil at 40° C., then add water slowly, maintaining temperature at 35–40° C.

Kier Penetrant Oil

Xylol	10 gal.
Sulphonated Castor Oil (62% T.F.M.)	20 gal.
Water	20 gal.

Manipulation: Sulphonate the castor oil to 62% T.F.M., settle and draw off. Mix in xylol first and then water, with agitation, at 35–40° C.

Silk Oil

Sulphonated Castor Oil (58%)	50 gal.
Paraffin Oil (28° Bé.)	10 gal.
Caustic Soda Solution (27° Bé.)	12 gal.
Water	23 gal.
Steam Distilled Pine Oil	12 gal.

Manipulation of Silk Oil: Mix ingredients in order named at 35–40° C., being careful to add caustic soda solution and pine oil very slowly, with constant stirring and allowing mixture to cool to room temperature as the pine oil is being added.

Soluble Oil

Formula No. 1

Paraffin Oil (28° Bé.)	33 gal.
Sulphonated Castor Oil (75%)	33 gal.
Sulphonated Red Oil (75%)	33 gal.

Manipulation: Mix at 40° C.

No. 2

Steam Distilled Pine Oil	50 gal.
Sulphonated Castor Oil (75%)	50 gal.
Caustic Soda (27° Bé.)	10 gal.
Water	40 gal.

Manipulation: Heat the pine oil to 38° C. in the lead lined tank, add the sulphonated castor oil, then add the caustic soda gradually with agitation, maintaining the temperature noted above with constant agitation. When nearly clear solution is obtained add the water slowly, continuing agitation, then allow to cool rapidly.

Soluble Textile Oil

Xylol or Toluol	15 gal.
Paraffin Oil (28° Bé.)	78 gal.
Double Pressed Red Oil	2 gal.
Alcohol	3 gal.
Caustic Soda Solution (27° Bé.)	1 gal.
Water	1 gal.

Manipulation: Mix the paraffin oil and red oil, heat to 40° C., add the previously mixed water and caustic solution, then add the xylol slowly and the alcohol last and rapidly cooling them as quickly as possible after mixture is uniform.

Wool "Soluble" Oil

U. S. Patent 1,965,935

An oil such as a mineral oil 64, is used in admixture with "Carbitol" 2, corn oil soap 14, rosin 10, water 6 and diethylene glycol 4%.

Wool Treating Oil

Formula No. 1

Neutral Light Mineral Oil	90 gal.
Double Pressed Red Oil	5 gal.
No. 1 Lard Oil	5 gal.

Manipulation: Mix at 45–50° C.

Equipment required: Wooden or lead lined mixing tank.

No. 2

Paraffin Oil (28° Bé.)	90 gal.
Double Pressed Red Oil	5 gal.
No. 1 Lard Oil	5 gal.

Manipulation: Mix at 45–50° C.

Textile Sizing Oil

Sulphonated Castor Oil (62% T.F.M.)	800 lb.
Water	550 lb.
Caustic Soda Solution (27° Bé.)	350 lb.
Silicate of Soda Solution (37° Bé.)	1300 lb.

Manipulation: Heat the sulphonated oil to 35–40° C. and slowly add the other ingredients in order given above, maintaining temperature above 35° C. until mixing is completed.

Oiling for Viscose Yarn

Ammonium Oleate	100 g.
Oleic Acid	25–30 g.
Alcohol	15 g.

Apply at 40–60° C.

A 1% solution of above works well at 40° C.; treating time 25 to 30 minutes.

Rayon Yarn Lubricant

U. S. Patent 1,979,188

Mineral Oil	60 lb.
Triethanolamine Oleate	9.7 lb.
Mineral Oil Sulphonate	9 lb.
Potassium Oleate	16 lb.
"Carbitol"	5 lb.
Aniline	0.3 lb.

Synthetic Neat's Foot Oil

Extra Lard Oil	30 gal.
No. 1 Lard Oil	30 gal.
Light Mineral Oil	30 gal.

Manipulation: Mix at 40° C.

Rayon Identification
(Revised Method)

The following systematic scheme, when carried out in the given sequence, serves for the rapid identification of rayons. This method can be depended upon by an experienced analyst, particularly when used in conjunction with *filament count* and *microscopical characteristics.* For the inexperienced man we recommend the detailed method of Rayon Analysis, and in comparison of the unknown rayon with standard samples of known make. The standards should be as inclusive of the rayon field as possible and should be kept up to date.

Rapid Method

Test 1—Identification of Animal Fibers

Millon's Test

Animal fibers—real silk, wool and hair—are quickly and positively identified by means of Millon's Reagent (see Identification of Rayon—Detailed Method).

Test 1A—Identification of Animal Fibers, Cellulose Fibers and Cellulose Acetate

Flame Test

Twist five or six strands of the un known sample into a long, compact mass. Push the end of sample gently toward a match flame. (Do not allow sample to actually touch the flame.)

Animal fibers tend to fuse and burn slowly when brought near to a flame. If the flame of the burning fibers is extinguished, the odor of the white fumes which subsequently arise from the smoldering end will have a "burned hair" odor. The burned ends of the fibers will have a dark, hard, brittle knob of material. Heavily mineral-weighted silks will leave a distinct ash which more or less retains the shape of the original material.

Vegetable fibers and most rayons do not fuse in the burning. They burn rapidly, and the fumes coming off after the extinguishing of the flame smell like burning cotton. *Acetate rayons, in burning, smell like cotton and melt like animal fibers.* The fused knob remaining after the flame is extinguished is hard but not brittle. If heated to a sufficient degree (in an evaporating dish or other suitable container) acetate fibers will melt without burning.

The burning test, while helpful, is not as instructive as the Millon's Reagent Test, inasmuch as it does not show the relative quantities and locations of the animal and vegetable fibers in mixed yarns or fabrics.

Test 2—Identification of Cellulose Acetate Rayon

Solvent Test

Cellulose Acetate Rayon is soluble in acetone; also in boiling 40% acetic acid. (See Identification of Rayon—Detailed Method.)

Test 3—Identification of Nitrocellulose Process Rayon

Diphenylamine Test

Nitrocellulose Rayon is turned blue by treatment with a solution consisting of 1% by weight of diphenylamine dissolved in concentrated sulphuric acetic acid mixture. (See Identification of Rayon—Detailed Method.)

Test 4—Identification of Viscose and Cuprammonium Rayons

Wright's Stain Test

Wright's Stain Test solution colors air-dried Cuprammonium Rayon violet and air-dried Viscose Process Rayon blue. (See Identification of Rayon—Detailed Method.)

Detailed Method

Chemical Identification of Rayon

(1) Identification of Animal Fibers in Mixed Fabrics

Millon Test

As small quantities of animal fibers present in unknown samples may cause

confusion in some of the following tests, an unknown sample should first be tested for the presence or absence of animal fibers. These are easily and quickly identified by means of the Millon Test, details of which follow:

Preparation of Millon's Reagent

Millon's Reagent is prepared by dissolving a given weight of metallic mercury in its own weight of pure concentrated nitric acid at room temperature in a non-corrodible container (porcelain, glass, agate, etc.). When completely dissolved, the solution is diluted and mixed with an equal volume of cold water. The solution should be clear.

If a yellow turbidity develops in the above noted solution, stir in a small quantity of nitric acid until the solution clears up.

Each new batch, or one which has stood open to the air for a long time, should be tested for proper activity by matching to the skin or by use of white animal fibers. When stored in air-tight glass stoppered bottles, the solution keeps for months.

Use of Millon's Reagent

Moisten the unknown swatch with Millon's Reagent. Warm to blood heat (do not boil) for a few seconds, or allow to stand for a few minutes at room temperature.

Animal fibers turn red, thus showing both their presence and position or distribution throughout the pattern.

Nearly all dyed animal fibers show an observable change toward red in this test without previous stripping of dye.

Swatches wet with water or with alcohol appear to react normally if flooded with reagent (to dissolve first precipitate).

Caustic Test

As minute quantities of cellulose and rayon fibers present in unknown samples largely composed of animal fibers may not be detected by the Millon Test, we recommend a subsequent caustic test for fabrics that appear by the Millon Test to be composed largely or entirely of animal fibers.

Although strength of solution, time and temperature may be varied over wide limits we recommend a 10% solution of caustic soda at 180° F. for 10 minutes.

Animal fibers dissolve completely. Cellulose and rayon remain in fiber form. (Note—Cellulose Acetate is partially saponified; regenerative cellulose fibers soften and dissolve to a limited extent. Cellulose Acetate fibers may be removed previously to caustic boil by use of acetone.)

(2) Identification of Cellulose Acetate Rayon

(*a*) Acetone Test

Place yarn or fabric in U.S.P. acetone.

Cellulose Acetate is very readily dissolved.

So-called *"iron-proofed"** Cellulose Acetate partially dissolves and leaves a leathery residue.

All other Rayons are unaffected by this treatment.

(*b*) Acetic Acid Test

Place yarn or fabric in a boiling solution of 40% acetic acid (C.P. acid is not necessary).

Cellulose Acetate is very readily dissolved.

So-called *"iron-proofed"** Cellulose Acetate partially dissolves and leaves a leathery residue.

All other Rayons are unaffected by this treatment.

* "Iron-Proofed" Cellulose Acetate

"Iron-proofed" Cellulose Acetate is Cellulose Acetate that has been treated with an alkaline medium in such a way that the outside of each individual filament is partially saponified.

"Iron-proofed" Acetate yarn may be pressed or ironed at a higher temperature than untreated acetate, because the layer of saponified or partially saponified acetate insulates the unaffected core of the yarn.

Treatments similar to iron-proofing, but more drastic, produce partially saponified yarn or fabric that can be dyed with direct dyes.

Partial saponification other than for iron-proofing is occasionally practiced. Such yarns produce a very considerable residue when treated by the acetone or acetic test for Cellulose Acetate.

(3) Identification of Nitrocellulose Rayon

Apply one drop of diphenylamine solution* to the dry unknown sample.

Nitrocellulose Rayon immediately turns a deep blue color after which it slowly dissolves to form a blue solution.

Other rayons are not colored blue.

All nitrated fibers—for example, Viscose Process Rayon nitrated for the production of special effects—show a blue reaction with diphenylamine solution. Many dyestuffs show a blue coloration when exposed to diphenylamine solution.

Nitrocellulose samples that have been stripped in a strong reducing bath will sometimes fail to give the blue coloration

* Diphenylamine solutions is prepared as follows: Mix 66 g. concentrated sulphuric acid with 33 g. of glacial acetic acid, then add 1 g. diphenylamine.

described above, however, their cross-sections remain unaltered in shape.

The only positive test for Nitrocellulose Rayons is a microscopic examination.

(4) Identification of Viscose and Cuprammonium Rayon

(*a*) Wright Stain Test

Prepare a saturated solution of Wright Stain (dry powder) in denatured alcohol (95%). Immerse *air-dried* unknown sample into boiling Wright Stain solution and boil for a few seconds. Rinse the sample thoroughly in cold water.

Viscose Process Rayon is stained blue by this treatment.

Cuprammonium rayon is stained violet.

(*b*) Schreiber-Hamm (Sulphide) Test

This test is suitable only for raw rayon of standard manufacture. Certain experimental yarns and processed yarns cannot be positively identified by this test.

A 5-g. sample of the unknown rayon (Viscose or Cuprammonium) is placed in a flask together with 100 cc. of water and 3 cc. concentrated sulphuric acid. The mouth of the flask is covered with a piece of lead acetate paper and allowed to stand on a moderately boiling steam bath for 4 hours.

If the sample is Viscose Process Rayon, the lead acetate paper will be stained brown or black.

If the sample is Cuprammonium Rayon, no discoloration should be observed.

(5) Identification of Undesulphurized Viscose Process Rayon

The difficulty of visually distinguishing between some delustered rayons and undesulphurized Viscose Rayon has sometimes led to confusion and improper rayon identification.

Undesulphurized Viscose Process Rayon can be readily identified by means of sodium plumbite solution.

Preparation of Sodium Plumbite Test Solution:

(1) Dissolve 40 g. lead nitrate in 200 cc. of warm water.

(2) Dissolve 70 g. of caustic soda in 300 cc. of water.

(3) Add the caustic soda *solution to* the lead nitrate solution.

(4) Filter.

(5) Dilute to 2 l.

Method of Testing

A small quantity of the solution prepared as above is brought to the boil. The unknown rayon sample is inserted into the boiling test solution for a period of ½ minute.

Undesulphurized viscose process yarn turns black.

Incompletely desulphurized viscose process yarns are turned black, dark brown, or medium brown, depending on the degree of desulphurization.

Desulphurized viscose process yarn is stained a brownish yellow color.

When possible, check tests on known samples should be run simultaneously with the test.

Microscopic Identification of Rayon

As rayons are most easily, quickly and positively identified by means of a microscopic examination, this method should be used whenever possible.

A microscopic examination of rayon is very simple and can be successfully carried out by men previously unfamiliar with the use of the microscope after a few hours' practice.

For the benefit of those unfamiliar with the microscope and its use, we are pleased to describe the cheapest type of microscope that is, in our opinion, suitable for the microscopic examination of rayon. The analyst will need:

1. Microscope Stand and Lenses.

The instrument should be capable of magnifying to 400 diameters.

The above combination includes achromatic objectives, 16 mm. and 4 mm., eye piece 5× and 10×; and Abbe condenser N.A. 1.20.

2. Microscope Lamp.
3. Microscope Slides and Cover Glasses.
4. Mounting Medium (Methylene Iodide, or Monobromnaphthalene).
5. A piece of thin glass rod.
6. A small scalpel or sharp knife.

Treatment of Viscose Products

Austrian Patent 138,007

Rayon and other products made from viscose are bleached and desulphurized by treatment first with an alkaline solution of hydrogen peroxide at a low temperature and then with an alkaline solution not containing hydrogen peroxide at a raised temperature. Thus, rayon may be treated at atmospheric temperature with a solution containing hydrogen peroxide 0.5 and sodium pyrophosphate 1%, freed from excess of liquid, left to stand for 3 hours at 35° C., and then treated at 95° with a solution containing sodium pyrophosphate 1 and Marseilles soap 1%. Alternatively, the material may be

treated with a single alkaline hydrogen peroxide solution first at a low temperature and later at a raised temperature.

Preservation of Ropes

Make a solution of sulphate of copper (blue vitriol) in water, using 1 lb. of the crystals in 4 gal. of water and soak the ropes in this solution for 4 days, then dry them. The ropes will become impregnated with the copper sulphate, which will keep them from being attacked by parasites and prevent rot. The copper salt may be fixed in the ropes by the application of a soap solution, made by slicing 1 lb. of yellow laundry soap in thin slices and dissolving it in boiling water. Use 1 lb. of soap to a gallon of water. While the soap solution is still lukewarm put the ropes in it and let them soak overnight. Next morning take the ropes out and let them dry. The copper soap thus formed is more effective than tar, which is used on ropes employed by sailors, but tar is likely to stain painted surfaces, so painters should stick to the soap treatment. Ropes must be kept in a warm, dry place, never in a basement, because dampness would injure them in time.

Sash Cord Impregnants

Formula No. 1

Paraffin Wax (130–132°F. M.P.)	8 oz.
Rosin	4 oz.
Rosin Oil	1 oz.
Carnauba Wax	1 oz.

No. 2

Lactic Casein	10 oz.
Borax	2 oz.
Pigment	60 oz.
Soap Solution	4 oz.
Caustic Soda	0.5 oz.
Ammonium Sulphate	0.8 oz.
Water	remainder

The soap solution can be sodium resinate or the potassium salt formed by boiling potassium carbonate (1 part) with carnauba wax (15 parts). The ammonium sulphate is added after all the other ingredients are in solution. The pigment could be china clay or talc colored to shade with a brown lake. The composition given would require further adjustment with water to give the right consistency in the coating tank.

Numida Dyeing of Feathers

Dissolve gum arabic in cold water to about the thickness of varnish.

Make up a solution containing:

Gum Arabic Water	1 glass
Cold Water	2 glasses
Glycerin	1 glass

Strain thoroughly to remove all particles of dirt, etc.

Take the dry feathers and work in this solution until thoroughly saturated, wring through the ordinary wash wringer, and squeeze out as much of the solution as possible, after which rub through the hands thoroughly for about 5 minutes in order to evenly distribute the remaining portion of the liquid that is in the feathers, after which string the feathers and beat them out on a wooden board for several minutes until the fine stems separate, after which hang up and dry overnight.

Feathers thus treated will retain this effect under all ordinary conditions.

Fabric Paint

Basic Dye	2 lb.
Ethylene Glycol	60 lb.
Zinc Chloride	6 lb.
Tannic Acid	6 lb.
Glacial Acetic Acid	6 lb.
Tragacanth Solution (1%)	90 lb.

Synthetic Resin for Impregnating Textiles

British Patent 422,957

Polyvinyl Chloride (60–65% Chlorine)	5–10 lb.
Methylene Chloride	6 lb.
Benzene	3 lb.
Butyl Acetate	1 lb.

Weighting Cotton Yarn

Cotton yarn may be weighted to a considerable extent, when dyed with the direct colors, by adding magnesium sulphate (Epsom salt) to the dye bath, together with a small quantity of dextrin. Owing to danger of imperfections in the color, such as unevenness and cloudiness, it is perhaps better to use a separate bath after the dyeing for the purpose of weighting. This will be especially true if it is desired to weight to any considerable extent. The following process is a typical example of weighting cotton yarn which has been dyed with direct colors. For 100 lb. of cotton yarn use a bath containing about 160 gal. of water; add 100 lb. of magnesium sulphate, 15 lb. of dextrin, and 2 lb. of glycerol. Have the temperature of the bath at about 120° F. The cotton yarn is entered into this bath and turned for

20 minutes, or until the fiber is thoroughly saturated with the solution. It is then removed, hydro-extracted and dried. Such a treatment as this will give a weighting of about 10 to 12% to the cotton yarn. The bath is by no means exhausted, and may be freshened up by the addition of a small amount of magnesium sulphate and dextrin till it is brought back to the same hydrometer test as at first, and succeeding lots of cotton may be treated as above. The glycerol is added for the purpose of preventing the weighting material from giving the fiber a stiff handle.

Rayon Spinning Solution

To a solution of 25 parts acetone-soluble cellulose acetate and 75 parts of 95% acetone plus 5% water is added 2.5 parts of a mixture containing mineral oil (100 viscosity at 100° F. Saybolt) 85, saponifiable oil (olive oil) 10, tetrahydronaphthalene 2.5 and soap (sodium oleate) 2.5%. The yarn spun from the solution is bright and fairly transparent and has superior knitting properties.

Wet Strength of Wet Fibers, as a Percentage of Their Dry Strength

Cotton	110–120%
Wool	80– 90%
Silk (True)	75– 85%
Acetate Silk	65– 70%
Cuprammonium Silk	50– 60%
Viscose Silk	45– 55%
Nitro Silk	30– 40%

MISCELLANEOUS

Boiler Compounds

Formula No. 1

Sodium Alginate (Crude)	20 lb.
Extract, Quebracho	12 lb.
Soda Ash	10 lb.
Trisodium Phosphate	10 lb.
Caustic Soda	1 lb.
Water	300 lb.

Manipulation: Dissolve the salts in the water and add the alginate and quebracho extract at room temperature.

No. 2

Anhydrous Disodium Phosphate	47 lb.
Soda Ash	44 lb.
Corn Starch	9 lb.

It should be noted that this formula includes both inorganic and organic constituents. The starch is added to bring about a state of colloidal suspension of the insoluble matter precipitated in the boiler so that a sludge is formed in preference to a scale.

Another composition which deserves consideration is the U. S. Navy Standard Compound, which is:

No. 3

Anhydrous Sodium Carbonate		76 lb.
Trisodium Phosphate		10 lb.
Dextrin or Starch		1 lb.
Cutch	sufficient to yield tannic acid	2 lb.
Water	to make up to	100 lb.

Coal Dust Briquettes

German Patent 616,376

Finely divided coal sludge brought to water content of 12 to 20% is mixed with 2 to 3% molasses and then compressed in molds and dried.

Fuel Briquettes for Motors

One hundred kilograms of sugar or molasses are mixed with 5 kg. of alum or a similar substance for inversion of the sugar and dissolved in 400 to 600 kg. of water, after which finely ground bituminous coal is added until a homogeneous mixture is obtained. The mixture is poured over 50 to 100 kg. of a finely disintegrated mass of sugar beets. Thirty to 50 parts by weight of the mass thus obtained are mixed with 70 to 50 parts of finely ground charcoal, and the mixture is pressed to briquettes under a pressure of 100 to 300 kg. per sq. cm. The briquettes are dried by heating in a separate drying chamber by means of combustion gases from a steam boiler furnace. The drying requires only about 15 to 30 minutes, during which the briquettes take on a coke-like appearance. Owing to the high temperature in the drying chamber, about 350° to 500° C., and the high water content of the briquettes, steam is formed during the drying which seems to have a hardening effect upon the briquettes. Under this high drying temperature the sugar content of the briquettes is caramelized. A suitable composition of the dry matter of the briquette mass is stated as 80 parts by weight of charcoal, 20 parts of bituminous coal, and 2 to 6 parts of sacchariferous binding substances.

Fuel Briquettes

U. S. Patent 1,977,332

Slowly burning briquettes suitable for use in orchard heaters are formed by mixing charcoal 50, sand 25 and a sugar-syrup binder about 25% so that all the particles of charcoal and sand are coated by the syrup, molding without applying pressure, evaporating moisture from the briquette in the mold and then heating to about 370° C. for about 2 hours to form an anhydrous porous mass, and cooling under air-tight conditions.

Briquettes

French Patent 766,979

Semicokes and fine coals are mixed with 6–12% of pitch, molded and heated to about 600° C. and then carbonized at 700–900° C.

Battery Paste

In the manufacture of lead-acid storage battery plates it frequently happens that the paste in the plates checks when

dried. The addition of a small amount of silicate of soda to the paste will reduce this tendency. The amount should be not over 1 oz. of the strong solution of silicate of soda (water glass) to 100 lb. of the oxide. This should be dissolved in about 1 pt. of water and added to the oxide before the acid is added.

Low-Voltage Storage Battery Paste

U. S. Patent 1,944,065

The paste for a lead accumulator contains (*a*) 0.9 to 1.5 weight per cent of nickel sulphate, or (*b*) 0.1 to 0.5 weight per cent of cobalt sulphate as active material.

Cold Storage Fluid

U. S. Patent 1,943,268

Fluids for cold storage comprise water (in each case) and butyl alcohol 10%, or ethyl ether of glycol acetate 20, or diethylene glycol butyl ether 5%.

Low Freezing Heat Transfer Medium

U. S. Patent 1,972,847

A stable heat transfer medium comprises a mixture of 60 parts of diphenyl oxide, 12 parts of naphthalene, 28 diphenyl.

Antifreeze Composition

Formula No. 1

A mixture of 65% isopropyl and 35% methyl alcohol is recommended for addition to radiator water. It does not attack the metal parts and changes the boiling point of water only slightly.

No. 2

U. S. Patent 1,997,735

A cooling medium having a freezing point below −45° F. and a boiling point above 217° F. consists of a solution formed by adding 2 lb. of calcium chloride and 7 oz. of aluminum chloride to glycerin, 1 pt., and water as 1 gal.

Prevention of Ice Formation on Airplanes

U. S. Patent 2,017,593

A mixture of liquids of different effects on rubber (such as pine oil 4, diethyl phthalate 4 and castor oil 1 part) is used in such relative proportions as not substantially to swell or otherwise deteriorate a rubber surface to which the composition is applied.

Anti-Knock Fuel

Formula No. 1

U. S. Patent 2,021,088

0.5 to 5% of ethylene diamine or 0.5 to 1% of a hydrate of the same is used with gasoline.

No. 2

U. S. Patent 1,973,320

A mixture for introduction into the cylinders of internal combustion engines to prevent knock or pinking and the deposition of carbon comprises 85 g. of uranium chloride and 15 g. of vanadium chloride dissolved in acetone.

No. 3

U. S. Patent 1,980,097

Chloral hydrate in small quantities may be utilized to assist the solution of the metallic chlorides. For example, 1 to 10 mg. of platinum chloride may be dissolved in 1000 cc. of butyl oxalate and 250 to 2500 mg. of vanadium chloride in the same amount of butyl oxalate. The solutions are then combined and sufficient butyl phthalate is added until it constitutes about 25% of the mixture.

Stabilization of Anti-Knock Compounds

British Patent 414,581

Decomposition of lead tetra-ethyl present in the fuels is prevented by the addition of a small amount, e.g., 0.01–0.05% of sodium fluoride, potassium fluoride or ammonium fluoride.

Detergent for Automobile Radiators

Formula No. 1

U. S. Patent 1,967,393

A mixture is used comprising ammonium hydroxide or cyclohexanol 1, a sulphonic acid derivative of an alkylated aromatic hydrocarbon such as sodium 1-isoprioylnaphthalene-2-sulphonate about 0.4 and an alkali metal carbonate such as sodium carbonate about 4 parts.

No. 2

U. S. Patent 1,967,394

This relates to a detergent mixture comprising an organic solvent immiscible with water such as ammonium hydroxide or cyclohexanol about 1, a sulphonic acid derivative of an alkylated aromatic hydrocarbon about 0.4 and sodium phosphate about 4 parts.

Carbon Electrodes for Batteries
British Patent 429,840

A mixture of finely-ground bone charcoal 34, wood charcoal 8, graphite 6, pinewood flour 8, ammonium sulphate 14, and sulphur 6 parts, with a binder made by stirring a mixture of wheat flour 6, sugar 18, water 7.5, and oil 15 parts at 80° C. for 15 minutes to burst the starch granules and dissolve the sugar, is extruded or pressed into the desired electrode shape, dried, and fired in cast iron boxes or in saggers packed in graphite or retort-gas carbon, the temperature being raised slowly to 1000° in 16 hours and maintained there for 4 hours. After cooling, ¼ of the block is immersed in a 2–5% solution of paraffin wax in petrol and the other ¾ is then immersed for 3–4 minutes in 10% aqueous ammonium chloride. The waxed top is then drilled, a copper terminal screwed in, and the joint again waxed. Finally the whole electrode is impregnated with a 10–12.5% solution of silicic acid in trichloroethylene, carbon tetrachloride or other volatile solvent and dried.

Brake Fluid Composition
U. S. Patent 1,928,956

A hydraulic fluid comprises, in solution, glycol acetate, e.g., 50% by volume, with smaller proportions of water 37–45 and sulphonated castor or linseed oil soap, 5–13.

Moisture-Resistant Bristles
U. S. Patent 1,953,980

The bristles are first impregnated with an aqueous heavy-metal salt (e.g., 1–3% aqueous aluminum acetate) and then with a water soluble soap of a fatty acid (e.g., 4% aqueous castile soap). They may also be dipped into a solution of a wax in xylene.

Catalyst
Canadian Patent 350,894

To a dry mixture of kieselguhr 150, gum tragacanth 10 and potassium sulphate 20 lb. is added with agitation a sodium vanadate solution prepared by treating 16 lb. of vanadium pentoxide with 10 gal. of water containing 11.3 lb. of sodium hydroxide. The mixture is diluted with 20 gal. of water and after thorough mixing sulphuric acid is added to neutralize or nearly neutralize the mixture. The mixture is evaporated to a consistency suitable to permit granulation or pelleting and the granules or pellets are heated for 1 hour at 600° C. The product is a catalyst for the oxidation of sulphur dioxide.

Catalyst for Ammonia Oxidation
U. S. Patent 2,017,683

Metallic cobalt, containing impurities 70, is heated to effect fusion with calcium carbonate 3.5–5 and calcium fluoride 1.7–3.5 parts, the slag formed is separated from the metal and the latter is converted into cobalt oxide.

Activation of Kaolin for Catalytic Purposes

Kaolin is ignited at 750–800° C. for 2 to 3 hours and treated in the cold with 33% nitric acid for 24 hours and the solution is then heated at 60–80° C. for 3 to 4 hours. Aluminum hydroxide is then precipitated and allowed to stand for 1 day at room temperature before filtration. It is dried at 100 to 120° C. and activated at 360–385° C. The catalyst is suitable for the dehydration of alcohol.

Regeneration of Spent Nickel Catalysts

The method consists essentially in treating the spent catalyst successively with a small quantity of 20° Bé. sodium hydroxide, sulphuric acid and water. Before saponifying the spent catalytic mass, it is heated with indirect steam with vigorous stirring till a homogeneous mass is obtained. The sodium hydroxide solution (60–80 l. for 500 kg. of catalyst) is then added, followed by sufficient water to make the mass fluid; saponification is effected by heating with stirring for 1½ to 2 hours. After transferring the soap to a lead-lined tank, it is decomposed with concentrated sulphuric acid, diluted with water and allowed to stand, and the supernatant fat is removed. The nickel is then boiled with sulphuric acid as usual. The recovery of nickel is 92–94%, as compared with 64–70% by the ordinary method.

Fuel Catalyst
French Patent 765,824

A mixture used for activating the combustion of solid fuels contains, e.g., manganese dioxide 32.1, organic material (wood charcoal) 2.5, sodium chloride 27.7 and sodium chlorate 37.7%.

Cable Insulation

U. S. Patent 1,946,322

The mixture comprises a hydrocarbon oil (e.g., cylinder oil) 95–50, and rosin free from oxidized components, especially abietic acid, 5–50%.

U. S. Mint Test Solutions for Counterfeit Coins

Gold

Concentrated Nitric Acid	6½	drachms
Hydrochloric Acid	15	drops
Distilled Water	5	drachms

Silver

Silver Nitrate	24 gr.
Nitric Acid	30 drops
Distilled Water	1 oz.

A drop of the above solutions will have no effect on genuine coins; but will stain others, i.e., spot them.

Capsules

British Patent 412,975

Capsules or coverings, for bottles, jars, metal tubes and rods, of the kind made from a composition containing cellulose ester and a substance which may be removed by a suitable solvent after formation of the capsule, etc., to cause the capsule, etc., to shrink on drying and fit tightly onto the article to which it is applied, are formed by compression, extrusion or injection from a composition produced by working or mixing together the cellulose ester, a water soluble softener and optionally, a plasticizer to produce a solid but plastic composition. Small amounts of a volatile solvent may be added to facilitate mixing. In an example, a mixture containing cellulose acetate 3, monochlorohydrin 2, monoglycerol benzoate 1 and water 2 parts is mixed at 80–100° C. until completely gelatinized and most of the water has evaporated. The material is then formed to the desired shape and rendered contractile by soaking in water to dissolve out the monochlorohydrin. The contractile capsule is then applied to the article on which it is to be used and, as the water dries out, the capsule shrinks into position. Filling materials, dyes or pigments may be added.

Motor Carbon Remover

U. S. Patent 2,004,628

A carbon removing composition is composed of kerosene, creosote, castor oil and amyl acetate, combined in substantially the following proportions: kerosene, 49½%; creosote, 25%; castor oil, 25% and amyl acetate, ½%.

Activating Adsorbent Clay

U. S. Patent 1,976,127

The method of activating adsorbent earths comprises mixing an earth with concentrated sulphuric acid in an amount equal to from 5% to 35% of the weight of the earth, heating the mixture to a temperature of 150 and 300° C. to obtain reaction of sulphuric acid with constituents of the earth and to also partially dry the earth and the products of such reaction by the combined effect of heating and the dehydrating action of the sulphuric acid, then bringing the resultant mixture into contact with water to dissolve soluble salts therefrom, separating the solution from the undissolved earth, and then drying the earth.

Processing Coal

Canadian Patent 324,976

Coal containing iron sulphide is thoroughly washed to remove dust and impurities and while wet is sprayed with a compound containing calcium chloride 92, potassium dichromate 3, manganese dioxide 3 and tannic acid 2 parts by weight. The burning properties and ash characteristics are improved and the deleterious effect of flue gases and tube-slagging is minimized.

Oil Treatment of Coal

U. S. Patent 2,005,512

The process of treating solid lump fuel to render the same dustless, consists of heating oil having a gravity of 19° to 30° Bé. at 60° F. and a Saybolt viscosity of 100 to 1200 at 100° F. to a spraying temperature of 100° to 250° F., and spraying the heated oil in finely atomized state on the fuel in quantities sufficient to deposit on the fuel a thin enveloping film of oil.

Fuel Oil Activator

Japanese Patent 101,701

Naphthalene	100 oz.
Anthracene	5– 10 oz.
Phenanthrene	1– 3 oz.

Thirty grams of the above is added to 5 gal. fuel oil to increase heating efficiency.

Dustproofing of Coke

A 1 to 1 emulsion of a thick petroleum oil and water is made at 94° C., and then diluted with 7 parts of water at 38° C. Two gallons are sprayed per ton of coke on the loading chutes.

Decolorizing Charcoal from Corncobs

Soak corncobs in 3% zinc chloride and 7% sulphuric acid for 24 hours. Distill destructively at 600° C. for 50 minutes and treat with superheated steam at 400° C.

Deodorizing Petroleum

Petroleum products may be conveniently deodorized by agitating thoroughly with quicklime, 3 oz. to the gal. and filtering.

Gasoline Gum Inhibitor

U. S. Patent 1,970,339

Nicotine pyrogallate or amylgallate is added in proportion of about 1/100%.

Coloring Leaded Gasoline

Canadian Patent 352,875

α(2-Methoxyphenylazo)-2-naphthol is used at rate of 2 to 12 oz. per 10,000 gal.

Liquid Dielectric Composition

U. S. Patent 1,999,004

Chlorinated biphenyl having a chlorine content of 60% is used in a proportion of 45% together with trichlorobenzene 25 and tetrachlornaphthalene about 30%.

Condenser Dielectric

A 50% solution of Bakelite in castor oil has a high dielectric constant, 5.6, as compared with 2.3 for transformer oil. A condenser having paper impregnated with the Bakelite mixture has a power factor of 1% against 0.5% with transformer oil, this being the only disadvantage.

Dielectric Materials

French Patent 765,876

Dispersions of metal soaps in insulating oils are used, e.g., 6–10 g. of aluminum stearate in 94–90% of oil.

"Coreth" Type Artificial Diesel Fuel

Alcohol	36 kg.
Coal-Tar Oil	28 kg.
Gas Oil	20 kg.
Wood Oil	10 kg.
Water	4 kg.
Degras, Saponified	2 kg.

Liquid Electric Insulation

British Patent 413,596

A mixture comprising mineral hydrocarbon oil (50–70 parts) and halogenated diphenyl, e.g., the polychlorinated derivative (50–30 parts).

Electrical Insulator

British Patent 429,730

Rutile	32 lb.
Talc	58 lb.
Blue Clay	6.5 lb.
Calcium Carbonate	3.5 lb.

Mix thoroughly and mold.

Electric Insulating Compositions

German Patent 616,056

A binder for use in making insulating compounds or materials comprises a resin, a vegetable drying oil, shellac and (as a flux) an aromatic compound boiling above 200° C. A specified binder comprises copal 12.5, wood oil 1.5, α-nitronaphthalene 1 and shellac 10 parts. Mixtures of the binder with subdivided mica or like material may be molded under heat and pressure, or a solution of the binder in an organic solvent may be applied to mica sheets and the latter then united by heat and pressure.

Electrical Insulating Fused Magnesia

British Patent 413,905

The electrical resistivity of fused magnesium oxide is permanently increased by heating slowly to 1149° F., maintaining it at this temperature for about 6 hours and finally cooling to room temperature in about 30–40 hours.

Vitreous (Electrical Insulating) Material

U. S. Patent 1,984,178

Silicon dioxide is fused with beryllium oxide 0.14–1.5 and aluminum oxide 0.2–2.0%.

Waterproofing Electrical Wires

Formula No. 1

Crepe Rubber	30 lb.
Mineral Spirits	30 lb.

Mill together until uniform, then add while mixing

Glue Solution (20%)	25 lb.

followed by

Water	20 lb.

No. 2
U. S. Patent 1,963,895

Mineral Oil	70 cc.
Neat's Foot Oil	25 cc.
Ethyl Acetate	1 cc.

Electrical Insulating Tape

Formula No. 1

Make up caoutchouc solutions.

a. Caoutchouc, Crude, in Smoked Pressed Sheets	20 kg.
b. Benzene or Benzoline	80 kg.

No. 2
Resin Compositions

Formula	*a*	*b*	*c*	*d*	
Rosin	40	30	20	20	g.
Rosin Oil	36	30	28	30	g.
Rosin Tar	—	10	—	—	g.
Petroleum Tar	—	—	10	—	g.
Stearin Tar	—	—	10	—	g.
Coal Tar	—	—	—	20	g.
Wood Tar, Anhydrous	—	—	—	10	g.
Mineral Oil	—	10	8	10	g.
Linseed Oil	24	20	24	10	g.

The formulae *a* and *b* are superior to the two others. For white ribbons, only pale resins, as *a*, are possible.

No. 3
Fillers and Pigments

For White Ribbons	*a*	*b*	
Lithopone	80	60	g.
Zinc White	20	20	g.
Barium Sulphate	—	20	g.
For Black Ribbons	*c*	*d*	
Barium Sulphate	40	20	g.
Vegetable Black	45	—	g.
Lamp Black	15	15	g.
Frankfort Black	—	45	g.
Chalk Powder	—	20	g.

No. 4
Definitive Mixture

White Cover Ribbon:

Rubber Solution (No. 1)	38 g.
Resin Composition (No. 2*a*)	22 g.
Fillers (No. 3*a*, 3*b*)	40 g.

Black Ribbon:	*a*	*b*	
Rubber Solution (No. 1)	44	42	g.
Resins (No. 2*b*, 2*c*)	26	—	g.
Resins (No. 2*d*)	—	30	g.
Fillers (No. 3*c*, 3*d*)	30	28	g.

No. 5
Coating to Be Applied by Hot Impregnation

White Coating

a. Linseed Oil (60° C.)	57 g.
a. Crude Rubber, in Small Pieces	6 g.
b. Resin	9 g.
c. Fillers (No. 3*a*, 3*b*)	28 g.

Prepare *a* in a kneading machine at 60° C., then heat up to 180° C.; when clear solution is formed, add melted *b*. Cool to 100° C., and add *c*, stir, and discharge above 70° C.

Black Coating

Linseed Oil	60 g.
Crude Rubber	6 g.
Rosin Tar	12 g.
Fillers (No. 3*c*, 3*d*)	22 g.

or

Mineral Oil	52 g.
Crude Rubber	6 g.
Petroleum Tar	12 g.
Wood Tar, Anhydrous	10 g.
Fillers (No. 3*c*, 3*d*)	20 g.

These masses should be kept at 60–80° C. in the impregnation vat.

Fusible Cut-Outs

British Patent 423,076

A fuse wire incorporated in a current consuming device, e.g., an incandescent or arc-discharge lamp, rectifier or valve, is composed of a brass containing 0.25 to 8% aluminum, e.g., copper 67, zinc 32, and aluminum 1%. This is non-oxidizable, has a higher resistance and melts rapidly.

Electrolytic Condensers

British Patent 421,628

An electrolytic condenser is wound in annular form to permit free circulation of air around it. Aluminum electrode strips are separated by strips of cloth impregnated with an electrolyte, of the composition glycol 400 cc., borax 25.6 oz., boric acid 17.0 oz. and water 25.6 oz.

Electrolytic Condenser Medium

U. S. Patent 1,973,554

Monoethanolamine	1 lb.
Ethylene Glycol	5 lb.
Boric Acid	5 lb.

Heat together until dissolved and add bentonite or starch to consistency desired.

Fingerprint "Raising" from Cloth

Dip in, or paint with a 10% solution of silver nitrate to which has been added a little acetic acid. Dry in dark room, then expose to ultra-violet light until of maximum intensity, and photograph.

Latent Fingerprinting

A piece of paper or other material on which one is searching for fingerprints is saturated in a sensitizing solution prepared by dissolving 2 g. of silver nitrate in 1 l. of distilled water. This is stored in a dark place. After having soaked for 2 hours in the silver nitrate bath, the paper is thoroughly washed in distilled water, first by soaking for 30 minutes and then two rinsings. There is left in the paper only the silver chloride which has been formed from the chlorides left by the perspiration and the silver nitrate. *The paper is hung up and allowed to dry thoroughly.* It is then developed, either with a developer of the M. G. type or with others, such as formaldehyde and sodium carbonate. Following the development the paper is again washed in water, then in a bath of hypo, washed, and dried, and is ready for observation.

If kept in a humid atmosphere the migration of the chlorides may be so intensified that in time a gray cloud is formed where the print was originally. In some cases the print goes through the paper. Prints made from the skin of a corpse are very poor and diffuse, although chloride is deposited.

Fire Extinguisher
U. S. Patent 2,010,729

A fire extinguishing composition comprises 48 parts by weight of sodium bicarbonate, 12 parts by weight of boric acid, 4½ parts by weight of potassium bitartrate, and about 1½ parts by weight of borax.

Fireproof Film Containers
British Patent 419,249

The walls are made of a mixture of sawdust 25, calcined magnesite 25, magnesium chloride (as a 25% aqueous solution) 30, potassium alum 10 and a mixture consisting of asbestos flour 4, asbestos fiber 3 and acetic acid 3, 10 parts.

Fluorescent Screens
French Patent 770,728

The screen contains zinc or cadmium borate, e.g., zinc silicate 10–12, calcium tungstate 45–50 and zinc or cadmium borate 40–45%.

Electrotyping Matrix
British Patent 430,660

A sheet of aluminum 0.007 in. thick, is cleaned with etching fluid or caustic soda and then coated with molten beeswax, preferably a mixture of gum damar 2 and beeswax 16 parts, heated to 160° F. The wax face is then coated with graphite to render the surface conductive.

Masking Taste of Chlorinated Water

Add 2 or 3 tablespoonfuls of wine to each liter of water.

Fish Baits

The common "baits" comprise two general categories: (1) artificial baits, and (2) natural baits.

Artificial baits may be classified as flies, spoons, spinners, phantoms, and a multitude of other contrivances, some of which may be used alone, and some in combination with natural baits. Flies are largely made of feathers, worsted, silk, tinsel, etc., and are fashioned to suggest an insect. Most flies, however, resemble only remotely any known insect. Other baits may be made of metal, wood, rubber, etc. The list is too extensive to enumerate here, and more may be learned from a reliable fishing tackle dealer than from reading pages of descriptions. With reference to natural baits, with which the following lists are concerned, a local angler can usually impart to the novice more practical knowledge in a short time than could be learned from a whole volume of discussion and descriptive matter.

Judging by the stomach contents of fishes, there are but few groups of animals, from worms to mammals, that do not afford food for one or another game fish. That some of these are occasionally swallowed by a fish, however, does not necessarily signify that they would make good bait. Furthermore, some of the best baits can never be the natural food of the fish. The groups of animals which comprise forms most commonly employed as bait, from the lowest form up, are: worms, mollusks, insects, crustaceans, fishes, birds, and mammals.

It must be borne in mind that baits used in one part of the country may be of little or no avail in another part, even for the same species of fish; and that in the same locality the proper baits often vary with the time of year. Furthermore, a killing bait of one day may prove ineffective on the next. Success in fishing, therefore, depends largely upon the experience, judgment, skill, and patience of the fisherman.

Vernacular names of the various animals used for bait differ greatly in dif-

ferent parts of the country; for instance, the stone fly of one section is the mill fly of another, and the hellgramite of one locality is the dobson of another, and so on. Therefore, any list of baits can be of only partial assistance. The following lists aim to give the most common baits under the names by which they are most widely known.

Natural Baits are used in several different ways, such as in still fishing, bait casting, skittering (modified form of casting), or trolling.

Live Bait.—It has always proved practically impossible to keep a large amount of live bait in restricted limits; furthermore, no fish will live indefinitely without food. The kind of food necessarily depends upon the kind of fish, but most shiners and other minnows are more or less carnivorous and finely ground meat of some kind would probably answer for this class. The most appropriate food, however, would be small crustaceans and aquatic insects such as are usually present in sluggish streams and small ponds. These may be collected by means of a gauze dip net. It is possible to stock a small pond or pool, or even a rain barrel, with small crustaceans and maintain a supply of that kind of food. Some species of bait minnows are much hardier than others, but in all cases, when kept in confinement much depends upon the maintenance of cleanliness and a sufficient supply of oxygen. The needed oxygen is best supplied by a continuous flow of well aerated water, but where this is impossible it may be furnished in a fine spray of compressed air introduced near the bottom of the tank. Cold water will dissolve more oxygen than warm water, therefore, the temperature should be kept low if possible. Overcrowding should be carefully avoided and all injured or sick fish should be removed as soon as detected. If feeding should be attempted great care should be taken to remove all food uneaten, as otherwise it will decay and pollute the water.

Conditions will vary according to the species of minnow, the size and character of the tanks or pools, the temperature of the water, and the number of fish per unit of space, and it is difficult, therefore, to furnish specific information without a knowledge of these factors.

Keeping and Rearing Earthworms for Bait.—Earthworms multiply by producing eggs which are laid in capsules in the ground. The young become fully grown in four or five months. One method of culture is to sink into the soil in some shady spot a box of suitable size, usually not less than 18 inches deep and of any desirable width. The top of the box should be made hinged, or removable, and placed from two to three inches below the surface of the surrounding soil. This box should be nearly filled with rich, dark loam that should be kept quite moist but not wet, for too much water will kill the earthworms quickly. The worms may then be collected and placed in this box, and may or may not be covered with a layer of green sod.

By far the easiest and most convenient way to collect earthworms is by the use of a flashlight or lantern at night. They may be found on the surface of ground which has been devoted for some years to lawn or sod purposes. The worms are usually much more numerous during the months of April, May, and June than at any other time, although they may be easily brought to the surface at any season of the year, except winter, by thoroughly sprinkling the soil in the early evening. If food is provided for the worms in the box, they may be kept almost indefinitely in such container without changing the soil. They have been raised successfully by feeding ordinary molasses spread on one side of a gunny sack, which is then laid on the surface of the ground with the sticky side downward, and the back of the bag then sprinkled with water. Powdered bread crumbs and crumbled hard boiled eggs have also been used as food.

Fresh Water Crawfish and Shrimp, Keeping Them Alive for Bait.—These crustaceans can be kept alive in tanks, small pools, or wooden boxes which are well supplied with running water. The best food for them is fresh meat fed in small pieces, but great care should be taken not to leave old and spoiled meat in the water for any length of time, as this will soon prove fatal. The boxes or other containers should not be overcrowded and should be cleaned often and the dead crawfish or shrimp thrown out, as they decay rapidly and will soon cause the death of the healthy ones. The same general treatment is used if the crustaceans are to be kept in closed tanks or aquaria.

Hellgramites.—These are the larval form of the dobson fly. They are found under stones in swift streams and are an excellent bait for bass. Hellgramites can be kept alive for a considerable time in floating bait boxes or in wet grass.

Glow Worms.—The term glow worm is

applied to the wingless female beetles of the family *Lampyridae.* They are nocturnal in habit and feed upon smaller insects and worms. They can be kept alive in loose, damp earth, covered with moist grass and kept in a cool place.

Preserving Minnows for Bait.—Take 1 part of formalin to 29 parts of water, place the minnows in this solution in a tightly closed jar or bottle and keep in the dark until they are to be used. In this way they will retain their colors and silvery hues better than if in the light.

When about to use the bait, soak it in fresh water to remove the formalin. A few drops of oil of rhodium may then be placed on the minnow to disguise the pungent odor of formalin that may remain in the fish after soaking. The oil of rhodium is said to be attractive to fish but be that as it may it does not repel them as the formalin is likely to do.

Dough Balls.—A tough paste may be made of moistened bean, wheat, or other flour, thoroughly mixed with a little sugar, or preferably honey. To give the paste a greater tenacity, cotton batting or wool should be stirred in. Ground or mashed white meat, such as veal or pork, or any bleached meat may be added, but this bait must be fresh and kept untainted. Dough balls may be made also by boiling rye flour to a consistency of paste, then sprinkling with corn flour and rolling into a "ball."

List of Common Fresh Water Game Fishes with General Mention of Some Baits Used in Their Capture

Bowfin, Dogfish, Grindle
  Frogs, minnows, pieces of fish, etc.

Blue Cat, Chuckle-Headed Cat, Fulton Cat
  Minnows, shiners, worms, crawfish, pieces of fish, meat, liver.

Spotted Catfish, Channel Cat, Fiddler
  Shiners, worms, meat, liver, dough balls.

Common Bullhead, Brown Bullhead, Speckled Bullhead
  Minnows, worms, frogs, grasshoppers, pieces of fish (chub, perch, sunfish), salt mackerel, salt pork, meat, liver.

Mud Cat, Yellow Cat, Goujon, Morgan Cat
  Crawfishes, fresh hickory shad, other fish baits.

Buffalo Fish
  Worms, insects.

Carp Sucker
  Worms, insects.

Sucker
  Earthworms, bits of crawfish.

Redhorse
  Worms, insects.

Chub
  Pieces of fish, insects, grasshoppers, worms.

Squawfish
  Worms, minnows, shiners.

German Carp
  For angling, various baits have been recommended. Worms, grubs, grasshoppers, and pieces of fresh meat have been used successfully, but the most highly recommended baits are composite pastes. Pellets of partly boiled potatoes are said to be good bait, as well as dough balls or corn kernels wrapped in mosquito bar.

American Eel, Fresh Water Eel
  Earthworms, shiners, grasshoppers, etc.

Mooneye
  Minnows, worms, insects.

Common Whitefish
  Worms, insect larvae, may flies, shrimp, pieces of fish, minnows.

Rocky Mountain Whitefish
  Worms, insects, fresh meat.

Salmon, Sea Salmon, Eastern Salmon
  Worms, smelt, shiners, pork rind.

Landlocked Salmon
  Smelts, shiners, worms.

Black Spotted Trout, Cut Throat Trou
  Worms, grasshoppers, insects, minnows, pieces of meat.

Steel Head Trout
  Shiners, worms, insects, grasshoppers.

Rainbow Trout
  Worms, grasshoppers, insects, shiners.

Brown Trout
  Worms, various insects, grasshoppers, crickets, shiners, minnows, pieces of fish, horse meat.

Loch Leven Trout
  Worms, various insects.

Chinook Salmon
  Smelts, shiners.

Brook Trout
  Earthworms or "barnyard hackle," grasshoppers, grubs, crickets, beetles, bumblebees, caterpillars, mill fly, caddis fly larvae, may fly, newts, mice, or bits of animal flesh. A capital bait is the beautifully tinted anal fin of a trout, which in water with some current waves wabbles and flutters in a most seductive manner on the hook.

White Trout, Golden Trout
  Worms, pieces of fish, smelts, minnows, shiners.

Dolly Varden Trout
  Worms, minnows, shiners, insects.

Lake Trout
Minnows, shiners, pieces of fish (Whitefish), ciscoes.
Grayling
Gaddis fly larvae, "rock worm," earthworms, grubs, crickets, grasshoppers, natural flies, or small bits of fat meat.
Smelt
Pieces of smelt, shiners, minnows, worms, shrimp.
Common Pike, Pickerel
Frogs, shiners, minnows, white chub, pork rind, fish belly, 3–4 in. piece pickerel stomach, perch belly.
Muskellunge
Small fishes, suckers, shiners, ciscoes, grasshoppers, frogs.
White Crappie
Worms, minnows, shiners.
Black Crappie, Calico Bass
Minnows, worms, small shiners.
Rock Bass, Redeye, Goggle-Eye
Small minnows, white grubs, earthworms, grasshoppers, crickets, small crawfish, yellow perch, fresh water mussel, frogs.
Warmouth Bass
(See Rock Bass.)
Red Robin, Long Eared Sunfish
Worms, insects, minnows.
Bluegill, Blue Sunfish
Worms, insects, insect larvae, shrimps, small crawfish, pieces of fresh water mussel.
Green Sunfish, Blue Spotted Sunfish
Worms, insects, insect larvae.
Pumpkinseed
Worms, insects, pieces of crawfish, pieces of meat.
Shell Cracker
Worms, insects, small crawfish, pieces of fish.
Black Bass
The best natural bait is the minnow, a shiner, chub, or the young of almost any fish, which is well adapted for either casting, trolling, or still fishing. In waters where it abounds, the crawfish is a good bait, especially the shedders or soft craws, to be used only for still fishing. The hellgramite, the larva of the corydalis fly, in its native waters, is also successful for still fishing. A small frog is capital bait n weedy waters, where it is usually cast overhead with a very short and stiff rod. Grasshoppers and crickets are sometimes employed with a fly-rod, in lieu of artificial flies, with good results. The salt water shrimp, where it is available, near the coasts, is also a good bait for still fishing. Cut bait is also sometimes useful. It should be remembered that all baits of whatever kind, should be kept in motion. A dead minnow answers as well as a live one for casting or trolling, but should be alive for still fishing. With crawfish, worms, shrimps or hellgramites, a float should be employed to keep them from touching the bottom. In casting the minnow it should be hooked through the lips, and reeled in slowly after each cast to imitate the motions of a live one as much as possible.
Large Mouth Black Bass, Oswego Bass
Live minnows and other live baits, such as grasshoppers, frogs, hellgramites, efts, worms.
Small Mouth Black Bass
Shiners, chub, small yellow perch with dorsal fin cut off, mad-tom, stone catfish, floor of mouth of pickeral cut like a fish, belly of bowfin, crawfish, hellgramites, crickets, efts, newts, small frogs, worms.
Wall Eyed Pike, Pike Perch, Jack Salmon
Live minnows, as fallfish or dace, corporal, roach, redfin, gudgeon, brook chub, piece of fish, worms.
Yellow Perch, Ringed Perch, American Perch
Worms, minnows, crickets, grasshoppers and other insects, small fishes, small frogs, crawfish, pieces of fish.
Striped Bass, Rockfish
Shiners, minnows, pieces of fish.
White Bass
Live minnows, grubs, earthworms.
Yellow Bass
Minnows (live bait), worms.
White Perch
Worms, grasshoppers, insects, minnows.
Fresh Water Drum, Croaker, Sheepshead, White Perch
Crawfish, pieces of fish, mollusks.
Burbot, Ling, Eel Pout, Cusk
Yellow perch, sunfish, lamprey, crawfishes, pieces of fish, smelts.

Cut Flower Vitalizer

U. S. Patent 1,978,201

Eight ounces of sugar or saccharin, 2 oz. of kaolin, 1 oz. of yeast, ½ oz. of charcoal, 1 cc. of oil of pine and ½ oz. of lime. The foregoing makes up a composition weighing about 12 oz. and this may be dissolved in a suitable amount of water. It has been found in practice that this diluted solution shows benefit to all cut flowers.

The benefit is so decisive that increased turgidity and intensified color in the tissue of leaf and petal are visible to the eye usually within 30 minutes after the flower stem is immersed in the diluted solution. This increased turgidity and intensified color is retained by the flower whether under average room temperature of 70° F. or in refrigerated temperatures of 40–50° F., although a cooler temperature, as when untreated, prolongs the life of the cut flower.

The treated cut flower under observation slowly continues its development, retaining a healthy and nourished appearance, to eventually produce seed as large and apparently vital as it would upon the parent plant which had been unusually well cared for.

Furthermore, a flower cut in the bud develops normally when treated in this solution; for instance the chrysanthemum cut when the bud first shows color will develop into a flower equal in every respect to its companions left uncut on the greenhouse bench.

Again the treated flower lasts much longer after being removed from water, in treatment such as florists must subject flowers to in funeral pieces.

Preserving Foliage

A method of preserving foliage consists in placing the leaves in a solution of glycerin 1 part, water 9 parts. The leaves are then removed from this solution, dried between blotting paper and pressed.

Gas Mask for Sulphur Dioxide

Flannel nose-bag masks, 7 in. by 8 in. and held over the face by rubber bands, are used as a protection against sulphur dioxide gas. Masks are soaked in the following solution:

Distilled Water	1000 cc.
Glycerin	250 cc.
Soda Ash	200 g.

Masks are worn while wet with the solution.

Gas-Producing Material for Inflating Hollow Rubber Articles
British Patent 416,591

A mixture of sodium nitrite 56.5, ammonium chloride 43.5, and ammonium carbonate 10 parts is inserted into hollow rubber articles prior to vulcanization; on heating carbon dioxide, ammonia and nitrogen are evolved which expand the article up to the mold during vulcanization.

Manufacture of Luminescent Materials
British Patent 414,905

A 2 to 1 mixture of zinc oxide (or magnesium oxide) and germanium dioxide is moistened with dilute aqueous manganese chloride and sintered at 1000° F. to produce zinc (or magnesium) germanate, which fluoresces bright greenish-yellow (or orange-scarlet) under excitation with cathode rays.

Match-Striking Surfaces
British Patent 411,688

An ignition surface, suitable for self-lighting cigarettes, etc., comprises a mixture of amorphous phosphorus and a cellulose derivative binder of the character of cellulose acetate. A mixture of 4 g. of amorphous phosphorus in 25 cc. of a 5% acetone solution of cellulose acetate is spread as a film on a suitable surface. Other solvents, e.g., ethyl acetate, may be used.

Microscope Slide Cleaner

Xylol	1 fl. oz.
n-Butyl Alcohol	1 fl. oz.
Alcohol, Anhydrous	2 fl. oz.
Water	1 fl. oz.

Sterile Modelling Clay
U. S. Patent 1,979,016

Seventy grains of chlorthymol for every 100 lb. of manufactured modeling clay are sufficient to render the same sterile and to preserve its hygienic condition for long periods of time. The finished product may be packed in air-tight containers for shipment and storage to prevent possible oxidation of its ingredients.

Preserving Fluid for Museum Specimens

Formaldehyde	12–25 oz.
Glycerin	10 oz.
Potassium Nitrite	0.1 oz.
Water	to make 100 oz.

Removing Formaldehyde Odor from Museum Specimens

Wash with water and submerge for ½ hour in:

Urea	5 oz.
Ammonium Phosphate	1 oz.
Water	94 oz.

If the specimen is to be replaced in

formaldehyde it should be washed free of urea.

Colored Neon Lights
U. S. Patent 1,951,006

A mixture of approximately 10% of argon with 90% of neon emits a lavender colored light. The proportions of the gases may vary widely, the colors and shades changing with the different compositions. It is preferable to employ from 5 to 25% of argon, the balance being principally neon. The addition of carbon dioxide to the mixture of neon and argon, for example, results in a white or substantially colorless light. Therefore, introduce a substance such as calcium or magnesium carbonate, which is capable of releasing carbon dioxide to the tube containing rare gases such as neon and argon. When the tube is energized, carbon dioxide is released, and produces the white or substantially colorless light until the modifying agent is exhausted. Such tubes have been operated for more than 700 hours without change of the light emitted.

In introducing the modifying agent to the tube, several methods may be employed: The agent may be supported inside the electrode; it may be attached to the electrode; it may be coated on the wall of the tube or electrode chamber; or it may be simply deposited in the electrode chamber or in the path of the discharge through the tube.

Other modifying agents may be used, for example, a suitable hydride such as magnesium hydride can be used to maintain a trace of hydrogen in the tube in admixture with the gases therein to effect a desired change in the color of the light emitted when the tube is energized.

Electrode, Neon
U. S. Patent 1,926,336

The electrode comprises a compressed cylinder of an intimate mixture of tantalum carbide (88%) and cesium chloride, rubidium chloride and lithium chloride (12%).

Oxalic Acid from Corncobs

Corncobs	100 lb.
Nitric Acid (95%)	3 lb.

Heat until dissolution is complete; cool and add:

Nitric Acid (50–55%)	3 lb.
Vandium Pentoxide	0.1 lb.

Allow to stand for 2 or 3 days; filter and evaporate the filtrate to obtain crude oxalic acid which may be purified by recrystallization.

Radiator Corrosion Inhibitor
U. S. Patent 1,992,689

For preventing corrosion in motor radiators containing alcohol and water the following formula is used:

a.	Triethanolamine	0.33 oz.
	Triethanolamine Phosphate	1.50 oz.
b.	Triethanolamine	0.75 oz.
	Lard Oil	0.75 oz.

Mix ingredients of *b* and stir into *a*. The above is used per 100 parts of alcohol.

Scale Preventing Mixture
Formula No. 1
French Patent 776,235

A mixture of formic acid 100 and digallic acid 6 parts is used.

No. 2
French Patent 776,234

A mixture of digallic acid 100, and trisodium phosphate 60 parts, is used to prevent scale in motor car radiators.

Non-Corrosive Chlorinated Solvents
U. S. Patent 1,966,881

Five-tenths to 2% of pinene is added to prevent corrosion.

Tellurium Alloy Rectifier
U. S. Patent 1,961,825

The rectifier consists of plates of magnesium and an alloy of:

Tellurium	97.5 oz.
Copper	2 oz.
Silver	2.5 oz.
Sodium	0.5 oz.

which are welded together by passing a current from one to the other with a film of water between them.

Aluminum Reflector Etching
U. S. Patent 1,999,042

Using hydrofluoric acid and nitric acid the aluminum is first dipped into a solution of 1 part concentrated hydrofluoric acid in 19 parts of water at a temperature of 50 to 60° C., until an etch of the desired depth is obtained. The surface is washed and the article is im-

mersed for several seconds in a solution of nitric acid containing 1 volume of acid to 1 volume of water and held at room temperature. The aluminum is washed and dried and a clean, bright and uniformly etched surface is obtained. In the sodium hydroxide-sodium fluoride etching procedure a 5% sodium hydroxide solution in water containing about 4% sodium fluoride is used. The aluminum is immersed in this solution at a temperature of about 90° C. until the desired etch is obtained. It is then removed, washed, and treated with a 1:1 nitric acid solution, washed and dried as before. Again a very satisfactory clean, bright, and uniformly etched surface is obtained. It should be noted that the presence of copper in the aluminum causes the metal to turn gray to black on immersion in the hydrofluoric acid or the sodium hydroxide solutions. This black coloration, due to copper, is removed by immersion in the nitric acid. However, the nitric acid does not remove the gray film due to graphitic silicon, if it is present, and this must either be removed by rubbing or prevented from forming.

The effect of the presence of a sufficient amount of copper in aluminum on its etching properties is pointed out specifically by the following examples: A sample of a commercial grade of aluminum containing about 1% of impurities, including 0.6% iron, 0.3% silicon, and 0.01% copper, when etched with hydrofluoric and nitric acids as above described, produces a surface which is irregularly etched, having a streaked appearance. On the other hand, a sample of aluminum containing 0.6% iron, 0.08% copper, and 0.18% silicon as impurities, when etched in a similar manner, produces a very satisfactory uniform reflecting surface.

Brine for Refrigeration

U. S. Patent 1,969,124

A eutectic solution for refrigerating purposes comprises barium chloride 19, potassium chloride 18 and sodium chloride 4 oz. per gallon of water.

Refrigerator Deodorant

Fill a small muslin bag with a good quality of granular activated carbon. The muslin bag may then be placed in the rear of a lower portion of the ice box and will absorb strong odors which tend to collect.

After six months use, the device may be reactivated by placing in the oven at 350° F. for about ½ hour.

Increasing Resistance of Magnesium Oxide

U. S. Patent 2,012,897

A process for increasing the electrical resistivity of fused magnesium oxide comprises heating magnesium oxide in an oxidizing atmosphere for approximately 6 hours at a temperature of approximately 2000–2300° F.

Salt Denaturant

Two per cent of wormwood powder is added to salt for industrial use.

Soot Destroyer

Canadian Patent 347,077

Lead Oxide	77 lb.
Salt	23 lb.

The above may be diluted with charcoal or sawdust.

Stop Leak Composition

U. S. Patent 1,988,764

A stop leak composition for water circulating systems, comprising as chief ingredients about 4 g. of paper pulp, 5 g. of sifted flax seed, 200 cc. of water, and a small percentage of a preservative.

Temperature Sensitive Compounds

The following color changes induced by temperature changes find applications in many fields:

1. Copper Ferrocyanide.—Is mahogany brown at room temperature, becomes brown-black on heating, returns to original color on cooling.
2. Arsenic Bisulphide.—Orange red at room temperatures, changes progressively to dark red and then brown at higher temperatures, returns to original color on cooling.
3. Lead Iodide. — Original orange changes to dark orange on heating.
4. Mercury Subsulphide.—Original yellow changes on heating to orange yellow, then orange, then red.
5. Lead Chromate.—Same changes as for mercury subsulphide.
6. Tin Subsulphide.—Original brown color (or orange yellow) changes to dark red, then nearly black, on heating. These changes are very temperature sensitive.

7. Silver Subiodide.—Green yellow at ordinary temperatures changes to orange when heated.

8. Mercury Subiodide.—Original yellowish green changes on heating to orange, red, and brownish red.

9. Weak Copper Bromide.—Original lemon-yellow turns to brown when heated, returning to original color when cooled.

10. Cobalt Chloride.—Is invisible at ordinary temperatures but becomes blue when heated.

11. Mercuric Oxide.—Red at ordinary temperatures, darkens on heating, becomes black eventually.

Thermionic Cathode

U. S. Patent 1,961,122

The filament consists of an alloy of:

Nickel	90 oz.
Iron	7.5 oz.
Titanium	2.5 oz.

Coated with barium oxide.

Protecting Carbide

Carbide will keep indefinitely if sprinkled uniformly with kerosene.

Tooth Desensitizer

(Hartman)

Ether	2 oz.
Alcohol	1 oz.
Thymol	1¼ oz.

Keep in a brown bottle, tightly stoppered.

Apply inside of tooth by means of a dab of absorbent cotton on a tooth pick. The cavity in which it is applied should be dry to insure lengthy desensitization. Contact should be for 1 to 1½ minutes. The cotton is then removed and the cavity is dried with a blast of hot air.

Denicotinized Cigarettes

Activated charcoal and silica gel is used in individual cigarettes for the absorption of nicotine. Charcoal (0.2 g.) or silica gel (0.1 g.) is an efficient denicotinizer.

Denicotinizing Tobacco

U. S. Patent 2,000,855

A method of denicotinizing tobacco comprises the steps of: wetting tobacco containing the usual bacteria, disposing the wetted tobacco loosely in layers and allowing the latter to stand with access of air thereto to produce fermentation of the tobacco, continuously adding acid to the extent necessary to neutralize the amino bases resulting from the fermentation, and drying the tobacco.

Treating Tobacco for Smoking

U. S. Patent 1,972,718

There is added to tobacco about 2% of an alkaline hydrated aluminum silicate which upon the smoking of the tobacco is capable of taking up gases and tarry compounds produced by the combustion.

Water-Softening Compound

U. S. Patent 1,952,408

A cake for domestic use, formed by pressure when moist, comprises sodium carbonate 62.5, sodium phosphate 30.0, calcium chloride 5.0, and sodium chloride 2.5%.

Base-Exchange Materials for Water Softening

British Patent 434,663

Raw clay is treated with concentrated hydrochloric or sulphuric acid, the supernatant acid removed, and the clay baked at 550–600° F. for 1 hour. The product is treated with 10% aqueous sodium silicate, then with 2% aqueous sodium aluminate at 100° F., and finally with 5% aqueous sodium chloride to increase the base exchange power.

Water Testing Indicator

British Patent 414,836

The dipping rod is coated with a paste made from chalk (16), glycerin (12), a saturated solution of rosin in turpentine (1), and methylene blue dissolved in methylated spirit (1); contact with water lightens the color.

Windshield Anti-Fog Compound

Formula No. 1

Windshields may be kept clear of fog, by occasionally wiping them with a cloth prepared by boiling it 10 minutes in a solution of:

Water	5 qt.
Glycerin	1 oz.
Sodium Oleate	1 oz.

Boil together 5 minutes before immersing cloth.

No. 2

Glycerin	10 oz.
Glycol Boriborate	4 oz.
Sulphonated Castor Oil	10 drops

TABLES

Weights and Measures

Troy Weight

24 grains = 1 pwt.
20 pwts. = 1 ounce
12 ounces = 1 pound

Apothecaries' Weight

20 grains = 1 scruple
3 scruples = 1 dram
8 drams = 1 ounce
12 ounces = 1 pound

The ounce and pound are the same as in Troy Weight.

Avoirdupois Weight

27 11/32 grains = 1 dram
16 drams = 1 ounce
16 ounces = 1 pound
2000 lbs. = 1 short ton
2240 lbs. = 1 long ton

Dry Measure

2 pints = 1 quart
8 quarts = 1 peck
4 pecks = 1 bushel
36 bushels = 1 chaldron

Liquid Measure

4 gills = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon
31½ gals. = 1 barrel
2 barrels = 1 hogshead
1 teaspoonful = ⅙ oz.
1 tablespoonful = ½ oz.
16 fluid oz. = 1 pint

Circular Measure

60 seconds = 1 minute
60 minutes = 1 degree
360 degrees = 1 circle

Long Measure

12 inches = 1 foot
3 feet = 1 yard
5½ yards = 1 rod
5280 feet = 1 stat. mile
320 rods = 1 stat. mile

Square Measure

144 sq. in. = 1 sq. ft.
9 sq. ft. = 1 sq. yard
30¼ sq. yds. = 1 sq. rod
43,560 sq. ft. = 1 acre
40 sq. rods = 1 rood
4 roods = 1 acre
640 acres = 1 sq. mile

Metric Equivalents

Length

1 inch = 2.54 centimeters
1 foot = 0.305 meter
1 yard = 0.914 meter
1 mile = 1.609 kilometers
1 centimeter = 0.394 in.
1 meter = 3.281 ft.
1 meter = 1.094 yd.
1 kilometer = 0.621 mile

Capacity

1 U. S. fluid oz. = 29.573 milliliters
1 U. S. liquid qt. = 0.946 liter
1 U. S. dry qt. = 1.101 liters
1 U. S. gallon = 3.785 liters
1 U. S. bushel = 0.3524 hectoliter
1 cu. in. = 16.4 cu. centimeters
1 milliliter = 0.034 U. S. fluid ounce
1 liter = 1.057 U. S. liquid qt.
1 liter = 0.908 U. S. dry qt.
1 liter = 0.264 U. S. gallon
1 hectoliter = 2.838 U. S. bu.
1 cu. centimeter = .061 cu. in.
1 liter = 1000 milliliters or 100 cu. c.

Weight

1 grain = 0.065 gram
1 apoth. scruple = 1.296 grams
1 av. oz. = 28.350 grams
1 troy oz. = 31.103 grams
1 av. lb. = 0.454 kilogram
1 troy lb. = 0.373 kilogram
1 gram = 15.432 grains
1 gram = 0.772 apoth. scruple
1 gram = 0.035 av. oz.
1 gram = 0.032 troy oz.
1 kilogram = 2.205 av. lbs.
1 kilogram = 2.679 troy lbs.

Approximate pH Values

The following tables give approximate pH values for a number of substances such as acids, bases, foods, biological fluids, etc. All values are rounded off to the nearest tenth and are based on measurements made at 25° C.

pH Values of Acids

Hydrochloric, N	0.1
Hydrochloric, 0.1N	1.1
Hydrochloric, 0.01N	2.0
Sulphuric, N	0.3
Sulphuric, 0.1N	1.2
Sulphuric, 0.01N	2.1
Orthophosphoric, 0.1N	1.5
Sulphurous, 0.1N	1.5
Oxalic, 0.1N	1.6
Tartaric, 0.1N	2.2
Malic, 0.1N	2.2
Citric, 0.1N	2.2
Formic, 0.1N	2.3
Lactic, 0.1N	2.4
Acetic, N	2.4
Acetic, 0.1N	2.9
Acetic, 0.01N	3.4
Benzoic, 0.1N	3.1
Alum, 0.1N	3.2
Carbonic (saturated)	3.8
Hydrogen Sulphide, 0.1N	4.1
Arsenious (saturated)	5.0
Hydrocyanic, 0.1N	5.1
Boric, 0.1N	5.2

pH Values of Bases

Sodium Hydroxide, N	14.0
Sodium Hydroxide, 0.1N	13.0
Sodium Hydroxide, 0.01N	12.0
Potassium Hydroxide, N	14.0
Potassium Hydroxide, 0.1N	13.0
Potassium Hydroxide, 0.01N	12.0
Lime (saturated)	12.4
Sodium Metasilicate, 0.1N	12.6
Trisodium Phosphate, 0.1N	12.0
Sodium Carbonate, 0.1N	11.6
Ammonia, N	11.6
Ammonia, 0.1N	11.1
Ammonia, 0.01N	10.6
Potassium Cyanide, 0.1N	11.0
Magnesia (saturated)	10.5
Sodium Sesquicarbonate, 0.1N	10.1
Ferrous Hydroxide (saturated)	9.5
Calcium Carbonate (saturated)	9.4
Borax, 0.1N	9.2
Sodium Bicarbonate, 0.1N	8.4

pH Values of Foods

Apples	2.9–3.3
Apricots	3.6–4.0
Asparagus	5.4–5.8
Bananas	4.5–4.7
Beans	5.0–6.0
Beers	4.0–5.0
Beets	4.9–5.5
Blackberries	3.2–3.6
Bread, white	5.0–6.0
Butter	6.1–6.4
Cabbage	5.2–5.4
Carrots	4.9–5.3
Cheese	4.8–6.4
Cherries	3.2–4.0
Cider	2.9–3.3
Corn	6.0–6.5
Crackers	6.5–8.5
Dates	6.2–6.4
Eggs, fresh white	7.6–8.0
Flour, wheat	5.5–6.5
Gooseberries	2.8–3.0
Grapefruit	3.0–3.3
Grapes	3.5–4.5
Hominy (lye)	6.8–8.0
Jams, fruit	3.5–4.0
Jellies, fruit	2.8–3.4
Lemons	2.2–2.4
Limes	1.8–2.0
Maple Syrup	6.5–7.0
Milk, cows	6.3–6.6
Olives	3.6–3.8
Oranges	3.0–4.0
Oysters	6.1–6.6
Peaches	3.4–3.6
Pears	3.6–4.0
Peas	5.8–6.4
Pickles, dill	3.2–3.6
Pickles, sour	3.0–3.4
Pimento	4.6–5.2
Plums	2.8–3.0
Potatoes	5.6–6.0
Pumpkin	4.8–5.2
Raspberries	3.2–3.6
Rhubarb	3.1–3.2
Salmon	6.1–6.3
Sauerkraut	3.4–3.6
Shrimp	6.8–7.0
Soft Drinks	2.0–4.0
Spinach	5.1–5.7
Squash	5.0–5.4
Strawberries	3.0–3.5
Sweet Potatoes	5.3–5.6
Tomatoes	4.0–4.4
Tuna	5.9–6.1
Turnips	5.2–5.6
Vinegar	2.4–3.4
Water, drinking	6.5–8.0
Wines	2.8–3.8

pH Values of Biologic Materials

Blood, plasma, human	7.3–7.5
Spinal Fluid, human	7.3–7.5
Blood, whole, dog	6.9–7.2
Saliva, human	6.5–7.5
Gastric Contents, human	1.0–3.0
Duodenal Contents, human	4.8–8.2
Feces, human	4.6–8.4
Urine, human	4.8–8.4
Milk, human	6.6–7.6
Bile, human	6.8–7.0

CONVERSION OF THERMOMETER READINGS

F°	C°	F°	C°	F°	C°	F°	C°	F°	C°	F°	C°
-40	-40.00	30	-1.11	80	26.67	250	121.11	500	260.00	900	482.22
-38	-38.89	31	-0.56	81	27.22	255	123.89	505	262.78	910	487.78
-36	-37.78	32	0.00	82	27.78	260	126.67	510	265.56	920	493.33
-34	-36.67	33	0.56	83	28.33	265	129.44	515	268.33	930	498.89
-32	-35.56	34	1.11	84	28.89	270	132.22	520	271.11	940	504.44
-30	-34.44	35	1.67	85	29.44	275	135.00	525	273.89	950	510.00
-28	-33.33	36	2.22	86	30.00	280	137.78	530	276.67	960	515.56
-26	-32.22	37	2.78	87	30.56	285	140.55	535	279.44	970	521.11
-24	-31.11	38	3.33	88	31.11	290	143.33	540	282.22	980	526.67
-22	-30.00	39	3.89	89	31.67	295	146.11	545	285.00	990	532.22
-20	-28.89	40	4.44	90	32.22	300	148.89	550	287.78	1000	537.78
-18	-27.78	41	5.00	91	32.78	305	151.67	555	290.55	1050	565.56
-16	-26.67	42	5.56	92	33.33	310	154.44	560	293.33	1100	593.33
-14	-25.56	43	6.11	93	33.89	315	157.22	565	296.11	1150	621.11
-12	-24.44	44	6.67	94	39.44	320	160.00	570	298.89	1200	648.89
-10	-23.33	45	7.22	95	35.00	325	162.78	575	301.67	1250	676.67
- 8	-22.22	46	7.78	96	35.56	330	165.56	580	304.44	1300	704.44
- 6	-21.11	47	8.33	97	36.11	335	168.33	585	307.22	1350	732.22
- 4	-20.00	48	8.89	98	36.67	340	171.11	590	310.00	1400	760.00
- 2	-18.89	49	9.44	99	37.22	345	173.89	595	312.78	1450	787.78
0	-17.78	50	10.00	100	37.78	350	176.67	600	315.56	1500	815.56
1	-17.22	51	10.56	105	40.55	355	179.44	610	321.11	1550	843.33
2	-16.67	52	11.11	110	43.33	360	182.22	620	326.67	1600	871.11
3	-16.11	53	11.67	115	46.11	365	185.00	630	332.22	1650	898.89
4	-15.56	54	12.22	120	48.89	370	187.78	640	337.78	1700	926.67
5	-15.00	55	12.78	125	51.67	375	190.55	650	343.33	1750	954.44
6	-14.44	56	13.33	130	54.44	380	193.33	660	348.89	1800	982.22
7	-13.89	57	13.89	135	57.22	385	196.11	670	354.44	1850	1010.00
8	-13.33	58	14.44	140	60.00	390	198.89	680	360.00	1900	1037.78
9	-12.78	59	15.00	145	62.78	395	201.67	690	365.56	1950	1065.56
10	-12.22	60	15.56	150	65.56	400	204.44	700	371.11	2000	1093.33
11	-11.67	61	16.11	155	68.33	405	207.22	710	376.67	2050	1121.11
12	-11.11	62	16.67	160	71.11	410	210.00	720	382.22	2100	1148.89
13	-10.56	63	17.22	165	73.89	415	212.78	730	387.78	2150	1176.67
14	-10.00	64	17.78	170	76.67	420	215.56	740	393.33	2200	1204.44
15	- 9.44	65	18.33	175	79.44	425	218.33	750	398.89	2250	1232.22
16	- 8.89	66	18.89	180	82.22	430	221.11	760	404.44	2300	1260.00
17	- 8.33	67	19.44	185	85.00	435	223.89	770	410.00	2350	1287.78
18	- 7.78	68	20.00	190	87.78	440	226.67	780	415.56	2400	1315.56
19	- 7.22	69	20.56	195	90.55	445	229.44	790	421.11	2450	1343.33
20	- 6.67	70	21.11	200	93.33	450	232.22	800	426.67	2500	1371.11
21	- 6.11	71	21.67	205	96.11	455	235.00	810	432.22	2550	1398.89
22	- 5.56	72	22.22	210	98.89	460	237.78	820	437.78	2600	1426.67
23	- 5.00	73	22.78	215	101.67	465	240.55	830	443.33	2650	1454.44
24	- 4.44	74	23.33	220	104.44	470	243.33	840	448.89	2700	1482.22
25	- 3.89	75	23.89	225	107.22	475	246.11	850	454.44	2750	1510.00
26	- 3.33	76	24.44	230	110.00	480	248.89	860	460.00	2800	1537.78
27	- 2.78	77	25.00	235	112.78	485	251.67	870	465.56	2850	1565.56
28	- 2.22	78	25.56	240	115.56	490	254.44	880	471.11	2900	1593.33
29	- 1.67	79	26.11	245	118.33	495	257.22	890	476.67	2950	1621.11

ALCOHOL PROOF AND PERCENTAGE TABLE

U. S. Proof at 60° F.	Per cent Alcohol by Volume at 60° F.	Per cent Alcohol by Weight	U. S. Proof at 60° F.	Per cent Alcohol by Volume at 60° F.	Per cent Alcohol by Weight
0	0.0	0.00	58	29.0	23.82
1	0.5	——	59	29.5	——
2	1.0	0.80	60	30.0	24.67
3	1.5	——	61	30.5	——
4	2.0	1.59	62	31.0	25.52
5	2.5	——	63	31.5	——
6	3.0	2.39	64	32.0	26.38
7	3.5	——	65	32.5	——
8	4.0	3.19	66	33.0	27.24
9	4.5	——	67	33.5	——
10	5.0	4.00	68	34.0	28.10
11	5.5	——	69	34.5	——
12	6.0	4.80	70	35.0	28.97
13	6.5	——	71	35.5	——
14	7.0	5.61	72	36.0	29.84
15	7.5	——	73	36.5	——
16	8.0	6.42	74	37.0	30.72
17	8.5	——	75	37.5	——
18	9.0	7.23	76	38.0	31.60
19	9.5	——	77	38.5	——
20	10.0	8.05	78	39.0	32.48
21	10.5	——	79	39.5	——
22	11.0	8.86	80	40.0	33.36
23	11.5	——	81	40.5	——
24	12.0	9.68	82	41.0	34.25
25	12.5	——	83	41.5	——
26	13.0	10.50	84	42.0	35.15
27	13.5	——	85	42.5	——
28	14.0	11.32	86	43.0	36.05
29	14.5	——	87	43.5	——
30	15.0	12.14	88	44.0	36.96
31	15.5	——	89	44.5	——
32	16.0	12.96	90	45.0	37.86
33	16.5	——	91	45.5	——
34	17.0	13.79	92	46.0	38.78
35	17.5	——	93	46.5	——
36	18.0	14.61	94	47.0	39.70
37	18.5	——	95	47.5	——
38	19.0	15.44	96	48.0	40.62
39	19.5	——	97	48.5	——
40	20.0	16.27	98	49.0	41.55
41	20.5	——	99	49.5	——
42	21.0	17.10	100	50.0	42.49
43	21.5	——	101	50.5	——
44	22.0	17.93	102	51.0	43.43
45	22.5	——	103	51.5	——
46	23.0	18.77	104	52.0	44.37
47	23.5	——	105	52.5	——
48	24.0	19.60	106	53.0	45.33
49	24.5	——	107	53.5	——
50	25.0	20.44	108	54.0	46.28
51	25.5	——	109	54.5	——
52	26.0	21.28	110	55.0	47.24
53	26.5	——	111	55.5	——
54	27.0	22.13	112	56.0	48.21
55	27.5	——	113	56.5	——
56	28.0	22.97	114	57.0	49.19
57	28.5	——	115	57.5	——

U. S. Proof at 60° F.	Per cent Alcohol by Volume at 60° F.	Per cent Alcohol by Weight
116	58.0	50.17
117	58.5	——
118	59.0	51.15
119	59.5	——
120	60.0	52.15
121	60.5	——
122	61.0	53.15
123	61.5	——
124	62.0	54.15
125	62.5	——
126	63.0	55.16
127	63.5	——
128	64.0	56.18
129	64.5	——
130	65.0	57.21
131	65.5	——
132	66.0	58.24
133	66.5	——
134	67.0	59.28
135	67.5	——
136	68.0	60.32
137	68.5	——
138	69.0	61.38
139	69.5	——
140	70.0	62.44
141	70.5	——
142	71.0	63.51
143	71.5	——
144	72.0	64.59
145	72.5	——
146	73.0	65.67
147	73.5	——
148	74.0	66.77
149	74.5	——
150	75.0	67.87
151	75.5	——
152	76.0	68.92
153	76.5	——
154	77.0	70.10
155	77.5	——
156	78.0	71.23
157	78.5	——
158	79.0	72.38
159	79.5	——
160	80.0	73.53
161	80.5	——
162	81.0	74.69
163	81.5	——
164	82.0	75.86
165	82.5	——
166	83.0	77.04
167	83.5	——
168	84.0	78.23
169	84.5	——
170	85.0	79.44
171	85.5	——
172	86.0	80.62
173	86.5	——
174	87.0	81.90
175	87.5	——
176	88.0	83.14
177	88.5	——
178	89.0	84.41
179	89.5	——
180	90.0	85.69
181	90.5	——
182	91.0	86.99
183	91.5	——
184	92.0	88.31
185	92.5	——
186	93.0	89.65
187	93.5	——
188	94.0	91.02
189	94.5	——
190	95.0	92.42
191	95.5	——
192	96.0	93.85
193	96.5	——
194	97.0	95.32
195	97.5	——
196	98.0	96.82
197	98.5	——
198	99.0	98.38
199	99.5	——
200	100.0	100.00

Buffer Systems

The following table gives some common buffer systems and the approximate pH of maximum buffer capacity. The zone of effective buffer action will vary with concentration but the general average will be ± 1.0 pH from the value given, for concentrations approximately 0.1 molar.

Glycocoll - Sodium Chloride - Hydrochloric Acid	2.0
Potassium Acid Phthalate-Hydrochloric Acid	2.8
Primary Potassium Citrate	3.7
Acetic Acid-Sodium Acetate	4.6
Potassium Acid Phthalate-Sodium Hydroxide	5.0
Secondary Sodium Citrate	5.0
Carbonic Acid-Bicarbonate	6.5
Primary Phosphate-Secondary Phosphate	6.8
Primary Phosphate-Sodium Hydroxide	6.8
Boric Acid-Borax	8.5
Borax	9.2
Boric Acid-Sodium Hydroxide	9.2
Bicarbonate-Carbonate	10.2
Secondary Phosphate-Sodium Hydroxide	11.5

Courtesy of W. A. Taylor & Company

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Amer. Druggist
Amer. Dyestuff Reporter
Amer. Electrop. Society
Amer. Paint Jol.
Amer. Perfumer
Amer. Photography
Amer. Wool & Cotton Reporter
Analyst
Anal. Fis. Quim.
Ault & Wiborg Varnish Wks. Handbook

Baker's Helper
Bakers Review
Baker's Weekly
Better Enameling
Bottler & Packer
Boyce Thompson Inst.
Brewers' Tech. Review
Brick & Clay Record
Br. Jol. Dent. Science
Brit. Jol. of Photography
Brit. Medical Jol.
Bull. Imp. Hyg. Lab.
Bulletin of Imperial Institute
Bull. Soc. Franc. Phot.

Camera
Camera (Luzern)
Canner
Cement & Cement Mfr.
Chemical Abstracts
Chemical Analyst
Chemical Industries
Chemical Weekblad
Chem. Zent.
Chemist & Druggist
Combustion
Confectioner's Jol.
Cramer's Manual

Dairy World
Dansk. Tids. Farm
Dental Lab'y Review
Devt. Part. Zeitung
Drug & Cosmetic Industry
Druggists Circular
Drugs, Oils, & Paints

Eastman Kodak Co.
Electric Journal

Farbe v. Lacke
Farben Zeitung
Farming S. Africa
Fein Mechanic v. Prazision
Fettchem, Umschan
Fils & Tissus
Focus
Food Manufacture
Fruit Products Jol.

Gelatin, Leim, Klebstoffe
Glass Industry

Hawaiian Planters' Record
Hide & Leather

Ice Cream Review
India Rubber World
Indian Lac Research Inst.
Industrial Chemist
Industrial Finishing
Int'l Tin Res. & Dev. Council

Jol. Amer. Dental Assn.
Jol. Amer. Medical Assn.
Jol. Chinese Chem. Soc.
Jol. Federation Curriers
Jol. Federation Light Leather Tanners
Jol. Ind. & Eng. Chemistry
J. Res. Nat. Bur. Standards
Jol. Rubber Industry
J. Russ. Rubber Ind.
Jol. Soc. Leather Trades
Jol. Soc. Rubber Ind. Japan

Keram Steklo
Khimstroi
Kozhevenna-Obuvnaya Prom.
Kunstdunger, Und Leim

Lakokras, Ind.
Leather Trades Review
Les Mat. Grasses
Lithographic Tech. Foundation

Malayan Agric. Jol.
Manufacturing Chemist
Meat
Meat Merchandising
Melliand
Metal Industry
Metall und Erz
Metallurg
Metallurgist
Metals & Alloys

Mich. Agric. Exp. Sta.
Monatschr. Textil-Ind.
Munic. Eng. San. Record

Nat'l Butter & Cheese Jol.
Nat'l Provisioner
Nickelsworth
Nitrocellulose

Ober Flachen Tach.
Oil & Color Trades Jol.
Oil & Soap

Paper Trade Jol.
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Peinture, Pigments, Vernis
Phar. Acta Helva
Pharmaceutical Jol.
Phot. Abstracts
Phot. Ind.
Phot. Korr.
Photog. Kronik
Phot. Rev.
Photo Rundschau
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Phytopathology
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Power
Practical Druggist
Practical Everyday Chemistry
Printing Industry
Prob. Edelmetalle
Process Engr. Mo.
Proc. World Petroleum Congress

Rayon & Mell. Tex. Monthly
Refiner & Nat. Gas Mfr.
Rev. Aluminum
Rev. Amer. Electro Society
Rock Products

Science
Shoe and Leather Journal
Soap
Soap Gazette & Perfumer
Solvent News
Sovet-Sakhar
Spirits
Synthetic & Applied Finishes

Textile Colorist
Textile Mfr.
Textile Recorder

U. S. Department of Agriculture
U. S. Bureau of Mines
U. S. Bureau of Standards

Veneers and Plywood

Z. Elektrochem.
Zeit. Unters. Lebensm.

COMMON NAMES OF CHEMICAL PRODUCTS

A

Acacia Gum	Gum Arabic
Acetate of Lime	Calcium Acetate
Acetic Ether	Ethyl Acetate
Acetin	Glyceryl Monoacetate
Acetyl Salicylic Acid	Aspirin
Acetylene Tetrachloride	Tetrachlorethane
Adeps Lanae	Lanolin
Alcohol	Ethyl Alcohol
Alumina	Aluminum Oxide
Aluminum Potassium Sulphate	Alum
Ammonia, Aqua	Ammonium Hydroxide
Aniline	Aniline Oil
Animal Charcoal	Bone Black
Aqua fortis	Nitric Acid
Argols	Crude Cream of Tartar
Arsenic, red	Arsenic Disulphide
Asphaltum	Mineral Pitch

B

Baking Soda	Sodium Bicarbonate
Banana Oil	Amyl Acetate
Barytes	Barium Sulphate, Natural
Benzene	Benzol
Benzine	Petroleum
Black Boy Gum	Accroides Gum
Black Lead	Graphite
Blanc Fixe	Barium Sulphate, Artificial
Bleaching Powder	Calcium Hypochlorite
Blue Stone Blue Vitriol	Copper Sulphate
Boiled Oil	Boiled Linseed Oil
Bone Black	Animal Charcoal
Boracic Acid	Boric Acid
Borax	Sodium Borate
Brazil Wax	Carnauba Wax
Brimstone	Sulphur
British Gum	Dextrin
Bromo "Acid"	Tetrabrom Fluorescein
Burnt Sugar Coloring	Caramel Color
Butanol	Butyl Alcohol
Butter Color	Annatto
Butter of Antimony	Antimony Chloride
Butyric Ether	Ethyl Butyrate

C

Calcium Phosphate, Acid	Calcium Phosphate, Monobasic
Calomel	Mercurous Chloride
Caoutchouc	India Rubber

Capsicum	Red Pepper
Carbolic Acid	Phenol
Carragheen	Irish Moss
Catechu	Cutch
Caustic Potash	Potassium Hydroxide
Caustic Soda	Sodium Hydroxide
Ceresin Wax	Ozokerite and Paraffin Mixture
Chalk	Calcium Carbonate
China Clay	Kaolin
China Wood Oil	Tung Oil
Chinese Wax	Insect Wax
Chloride of Lime	Calcium Hypochlorite
Cholestrin	Cholesterol
Chrome Green	Chromium Oxide
Cinnabar	Mercuric Sulphide
Citronella Oil	Verbena Oil
Cognac Oil	Oenanthic Ether
Colloidal Clay	Bentonite
Collodion	Nitrocellulose "solution"
Cologne Spirits	Ethyl Alcohol (pure)
Colophony	Rosin Pine Resin
Columbian Spirits	Methyl Alcohol (pure)
Colza Oil	Rape Seed Oil
Copper Aceto Arsenite	Paris Green
Copper Arsenite	Scheele's Green
Corn Sugar	Dextrose
Corn Syrup	Glucose
Corrosive Sublimate	Mercuric Chloride
Corundum	Aluminum Oxide
Cream of Tartar	Potassium Bitartrate
Cresol	Cresylic Acid
Crude Oil	Petroleum (crude)
Cyanamid	Calcium Cyanamide

D

Dead Oil	Creosote Oil
Decalin	Decahydronaphthalene
Degras	Wool Grease
Dope	Pyroxylin "solution"
Dutch Liquid	Ethylene Chloride

E

Earth, Infusorial	Earth, Diatomaceous
Egg Oil	Egg Yolk
Elaterite	Mineral Rubber
Epsom Salts	Magnesium Sulphate
Ether	Ethyl Ether
Ethyl Nitrite	Nitrous Ether

F

Fir, Balsam	Canada Balsam
Flaxseed	Linseed
Flea-seed	Psyllium
Fluorspar	Calcium Fluoride
Fool's Gold	Iron Pyrites
Formalin	Formaldehyde (40% solution)
French Chalk	Talc
Fuchsine	Magenta
Fusel Oil	Amyl Alcohol (fermentation amyl alcohol)

G

Galena	Lead Sulphide
Glance Pitch	Manjak
Glass, Water	Sodium Silicate
Glauber's Salt	Sodium Sulphate
Glycerin	Glycerol
Glycol	Ethylene Glycol
Graphite	Plumbago
Green Soap	Soft Soap
Green Vitriol	Ferrous Sulphate
Ground Nut Oil (Arachi's Oil)	Peanut Oil
Gum Lac	Shellac
Gun Cotton	Nitro-Cellulose
Gypsum	Calcium Sulphate

H

Heavy Spar	Barium Sulphate
Hematite	Iron Oxide
Hexamine	Hexamethylenetetramine
Hydrosulphite (hydrosulfite)	Sodium Hydrosulphite

I

Ichthyol	"Ammonium Sulfo Ichthyolate"
Indene	Para-cumarone
Indian Gum	Karaya, Gum
Isinglass, Japanese	Agar Agar
Italian Red	Iron Oxide (red)
Ivory Black	Bone Black

K

Kauri Gum	Copal, Gum
Kieselguhr	Tripoli Diatomaceous Earth

L

Lanum	Lanolin
Lead Chromate	Chrome Yellow
Lead Sulfate, Basic	Whitelead, Sublimed
Lemon, Salts of	Potassium Binoxalate
Licorice	Glycyrrhiza
Ligroin, Light	Petroleum Ether
Lime	Calcium Oxide
Lime, Slaked	Calcium Hydroxide
Limestone	Calcium Carbonate
Litharge	Lead Monoxide
Liver of Sulphur	Potassium Sulphide
Lunar Caustic	Silver Nitrate
Lye	Sodium Hydroxide

M

Magnesium, Calcined	Magnesium Oxide
Magnesium Silicate	Talcum
Maize Oil	Corn Oil
Malt Sugar	Maltose
Metol	Methyl-para-aminophenol Sulphate
Microcosmic Salt	Sodium Ammonium Phosphate

Milk Sugar	Lactose
Mineral Pitch	Asphalt
Minium	Lead Oxide (red)
Mirbane Oil	Nitrobenzol
Muriatic Acid	Hydrochloric Acid
Myrtle Wax	Bayberry Wax

N

Naphtha, Solvent	Coal Tar Naphtha
Naples Yellow	Lead Antimonate
Nickel Salts, Double	Nickel Ammonium Sulphate
Nickel Salts, Single	Nickel Sulphate
Niter	Potassium Nitrate
Niter Cake	Sodium Bisulphate
Nitrocellulose (soluble cotton)	Pyroxylin

O

Oleic Acid	Red Oil
Olein	Glyceryl Tri-oleate (natural)
Oleum	Sulphuric Acid (fuming)
Olive Oil	Sweet Oil
Orange Mineral	Orange Red Lead Oxide
Orpiment	Arsenous Sulphide (yellow)

P

Paraffin Oil	Mineral Oil Petrolatum, Liquid
Paris White	Whiting
Pearl Ash	Potassium Carbonate
Petrol	Gasoline
Petrolatum	Petroleum Jelly
Plaster of Paris	Calcium Sulphate plus 1 mol. water
Potassium Bicarbonate	Salaterus
Prussian Blue	Ferric Ferrocyanide
Prussiate of Potash, Red	Potassium Ferricyanide
Prussiate of Potash, Yellow	Potassium Ferrocyanide
Prussic Acid	Hydrocyanic Acid
Pyramidon	Amidopyrine
Pyrethrum	Insect Flowers (powdered)
Pyroligneous Acid	Wood Vinegar

Q

Quicklime	Calcium Oxide
Quicksilver	Mercury

R

Red Oxide	Ferric Oxide, Red
Rochelle Salt	Potassium Sodium Tartrate
Rottenstone	Tripoli

S

Saccharine	Glucoside
Sal Ammoniac	Ammonium Chloride
Sal Soda	Sodium Carbonate, Hydrated
Salad Oil	Cottonseed Oil
Salt	Sodium Chloride
Salt Cake	Sodium Sulphate (by-product)

Saltpeter ....Potassium Nitrate
Scale Wax ....Paraffin Wax (low melting)
Silica ....Silicon Dioxide
Sod Oil ....Degras
Soda Ash ....Sodium Carbonate, Anhydrous
Sodium Bisulphite ....Sodium Acid Sulphate
Sodium Phosphate, Dibasic ....Disodium Phosphate
Sodium Phosphate, Monobasic ....Monosodium Phosphate
Sodium Phosphate, Tribasic ....Trisodium Phosphate
Sodium Thiosulphate ....Hypo
Sperm Oil ....Whale Oil
Spirits of Turpentine ....Turpentine
Stannous Chloride ....Tin Crystals
Stearin ....Tristearin
Storax ....Styrax
Sucrose ....Cane Sugar / Beet Sugar
Sugar of Lead ....Lead Acetate
Sulfonated Castor Oil ....Turkey Red Oil
Sulphur Olive Oil ....Olive Oil Foots
Sulphuric Acid ....Oil of Vitriol
Sulphuric Ether ....Ether

T

TNT ....Trinitrotoluene
Tartar Emetic ....Antimony Potassium Tartrate
Tetralin ....Tetrahydro Naphthalene
Theobroma Oil ....Cacao Butter
Titanium Dioxide ....Titanium Oxide
Toluene ....Toluol
Triacetin ....Glycerol Triacetate
Trinitrophenol ....Picric Acid

V

Verdigris ....Copper Acetate, Basic
Vermilion ....Mercuric Sulphide, Red

W

Whale Oil ....Train Oil
White Arsenic ....Arsenic Trioxide
White Bole ....Kaolin
White Lead ....Lead Carbonate, Basic
White Metal ....Babbitt Metal
White Wax ....Beeswax (bleached)
Whiting ....Chalk, Refined
Wintergreen Oil, Synthetic ....Methyl Salicylate
Wood Alcohol ....Methyl Alcohol

Y

Yacca Gum ....Accroides Gum

Z

Zinc White ....Zinc Oxide
Zinc Yellow ....Potassium Zinc Chromate
Zinc Sulphate ....Salts of Vitriol

Trade Named Chemicals

During the past few years, the practice of marketing raw materials, under names which in themselves are not descriptive chemically of the products they represent, has become very prevalent. No modern book of formulae could justify its claims either to completeness or modernity without numerous formulae containing these so-called "Trade Names."

Without wishing to enter into any discussion regarding the justification of "Trade Names," the Editors recognize the tremendous service rendered to commercial chemistry by manufacturers of "Trade Name" products, both in the physical data supplied and the formulation suggested.

Deprived of the protection afforded their products by this system of nomenclature, these manufacturers would have been forced to stand helplessly by while the fruits of their labor were being filched from them by competitors who, unhampered by expenses of research, experimentation and promotion, would be able to produce something "just as good" at prices far below those of the original producers.

That these competitive products were "just as good" solely in the minds of the imitators would only be evidenced in costly experimental work on the part of the purchaser and, in the meantime irreparable damage would have been done, to the truly ethical product. It is obvious, of course, that under these circumstances, there would be no incentive for manufacturers to develop new materials.

Because of this, and also because the "Chemical Formulary" is primarily concerned with the physical results of compounding rather than with the chemistry involved, the Editors felt that the inclusion of formulae containing various trade name products would be of definite value to the producer of finished chemical materials. If they had been left out many ideas and processes would have been automatically eliminated.

As a further service a list of the better known "trade name" products is appended together with the suppliers of these materials. The number after each trade name refers to the supplier given below with the corresponding number.

TRADE NAMES

A

B

C

SUPPLIERS OF TRADE NAME CHEMICALS

1. Acheson Graphite Corp., Niagara Falls, N. Y.
2. Advance Solvents & Chem. Corp., New York City
3. American Aniline Products, Inc., New York City
4. American Chem. Prod. Co., Rochester, N. Y.
5. American Colloid Co., Chicago, Ill.
6. American Cyanamid & Chem. Co., New York City
7. Anchor Chem. Co., Manchester, England
8. Anderson Prichard Oil Corp., Oklahoma City, Okla.
9. Ansbacher-Siegle Corp., Rosebank, N. Y.
10. Archer-Daniels-Midland Co., Minneapolis, Minn.
11. Arkansas Co., New York City
12. Atlantic Refining Co., Phila., Pa.
13. Bakelite Corp., New York City
14. Baker, J. T. Chem. Co., Phillipsburg, N. J.
15. Barber Asphalt Co., Phila., Pa.
16. Barrett Co., New York City
17. Beck, Koller & Co., Detroit, Mich.
18. Bick & Co., Inc., Reading, Pa.
19. Binney & Smith, New York City
20. British Drug Houses, Ltd., London, England
21. Bud Aromatic Chem. Co., Inc., New York City
22. Buromin Corp., Pittsburgh, Pa.
23. Bush, W. J. & Co. Inc., New York City
24. Cabot, Godfrey L. Inc., Boston, Mass
25. Calco Chem. Co., Bound Brook, N. J.
26. Campbell, John & Co., New York City
27. Carbic Color & Chem. Co., New York City
28. Carbide & Carbon Chem. Corp., New York City
29. Carborundum Co., Niagara Falls, N. Y.
30. Casein Mfg. Co., New York City
31. Celluloid Corp., Newark, N. J.
32. Century Stearic Acid & Candle Wks., New York City
33. Champion Fibre Co., Canton, No. Car.
34. Chaplin-Bibbo, New York City
35. Chemical & Pigment Co., Inc., Scranton, Pa.
36. Chemical Solvents Inc., New York City
37. Chesebrough Mfg. Co., New York City
38. Ciba Co., Inc., New York City
39. Colgate-Palmolive-Peet Co., Jersey City, N. J.
40. Colledge, E. W., Inc., Cleveland, O.
41. Columbia Alkali Corp., New York City
42. Commercial Solvents Corp., Terre Haute, Ind.
43. Commonwealth Color & Chem. Co., Brooklyn, N. Y.
44. Corn Products Refining Co., New York City
45. Darco Sales Corp., New York City
46. Deep Rock Oil Corp., Chicago, Ill.
47. Dennis, Martin & Co., Newark, N. J.
48. Dodge & Olcott Co., New York City
49. Dow Chem. Co., Midland, Mich.
50. Ducas, B. P. Co., New York City
51. DuPont, E. I., de Nemours & Co., Wilmington, Del.
52. Eastman Kodak Co., Rochester, N. Y.
53. Economic Materials Co., Chicago, Ill.
54. Emery Industries, Inc., Cincinnati, O.
55. Felton Chem. Co., Brooklyn, N. Y.
56. Fezandié and Sperrlé, Inc., New York City
57. Fougera, E. & Co., New York City
58. Franco-Amer. Chem. Works, Carlstadt, N. J.

59. Fries Bros., New York City
60. Fritzchie Bros., New York City
61. Geigy Co. Inc., New York City
62. General Atlas Carbon Co., New York City
63. General Chemical Co., New York City
64. General Drug Co., New York City
65. General Dyestuffs Corp., New York City
66. General Electric Co., Schenectady, N. Y.
67. General Naval Stores Co., New York City
68. General Plastics Inc., No. Tonawanda, N. Y.
69. Givaudan-Delawanna, Inc., New York City
70. Glyco Products Co., Inc., New York City
71. Goldschmidt Corp., New York City
72. Goodyear Tire & Rubber Co., Akron, O.
73. Grasselli Chem. Co., Cleveland, O.
74. Greef, R. W. & Co., Inc., New York City
75. Hall, C. P. & Co., Akron, O.
76. Halowax Corp., New York City
77. Harshaw Chem. Co., Cleveland, O.
78. Heine & Co., New York City
79. Hercules Powder Co., Wilmington, Del.
80. Hooker Electro-Chem. Co., New York City
81. Hopkins, J. L. & Co., New York City
82. Industrial Chem. Sales Co., New York City
83. Innis, Speiden & Co., New York City
84. International Pulp Corp., New York City
85. Johns-Manville Corp., New York City
86. Jungmann & Co., New York City
87. Kay-Fries Chemicals, Inc., New York City
88. Kessler Chem. Corp., New York City
89. Koppers Products Co., Pittsburgh, Pa.
90. Krebs Pigment & Color Corp., Newark, N. J.
91. Lehn & Fink Corp., New York City
92. Lewis, John D., Inc., Providence, R. I.
93. Liquid Carbonic Corp., Chicago, Ill.
94. Lucidol Corp., Buffalo, N. Y.
95. Magnus, Mabee & Reynard, Inc., New York City
96. Mallinckrodt Chem. Works, St. Louis, Mo.
97. Martin, Dennis Co., Newark, N. J.
98. Mathieson Alkali Co., New York City
99. McCormick & Co., Baltimore, Md.
100. Merck & Co. Inc., New York City
101. Monsanto Chem. Works, St. Louis, Mo.
102. Moore-Munger, New York City
103. Mutual Chem. Co. of Amer., Newark, N. J.
104. National Aluminate Corp., Chicago, Ill.
105. National Aniline & Chem. Co., Buffalo, N. Y.
106. National Oil Products Co., Harrison, N. J.
107. National Rosin Oil & Size Co., New York City
108. Naugatuck Chem. Co., New York City
109. Neville Co., Pittsburgh, Pa.
110. New Jersey Zinc Sales Co., New York City
111. Nulomoline Co., New York City
112. Nuodex Products, Inc., Newark, N. J.
113. Onyx Oil & Chem. Co., Passaic, N. J.
114. Papermakers' Chem. Corp., Wilmington, Del.
115. Paramet Chem. Corp., Long Island City, N. Y.
116. Penick, S. B. & Co., New York City
117. Penn. Alcohol Corp., Phila., Pa.
118. Penn. Salt Mfg. Co., Phila., Pa.
119. Pfaltz & Bauer, Inc., New York City
120. Phila. Quartz Co., Phila., Pa.
121. Plymouth Organic Labs., New York City
122. Pylam Products Co., New York City
123. Rauh, Robert Inc., Newark, N. J.

124. Reilly Tar & Chem. Corp., Indianapolis, Ind.
125. Resinous Prod. & Chem. Co., Philadelphia, Pa.
126. Resinox Corp., New York City
127. Revertex Corp., New York City
128. Robeson Process Co., New York City
129. Rohm-Hass Chem. Co., Philadelphia, Pa.
130. Royce Chem. Co., Carlton Hill, N. J.
131. Rubber Service Labs. Co., Akron, O.
132. Russia Cement Co., Gloucester, Mass.
133. Salomon, L. A. & Bro., New York City
134. Sandoz Chem. Works, New York City
135. Scholler Bros., Inc., Philadelphia, Pa.
136. Schliemann Co., Inc., New York City
137. Scott, Bader & Co., London, England
138. Seeley & Co., New York City
139. Sharples Solvents Corp., Philadelphia, Pa.
140. Shawinigan, Ltd., New York City
141. Sherwood Petroleum Co., Brooklyn, N. Y.
142. Silver, Geo., Import Co., New York City
143. Sonneborn, L. Sons, New York City
144. Southwark Mfg. Co., Camden, N. J.
145. Spencer-Kellogg Co., New York City
146. Stamford Rubber Supply Co., Stamford, Conn.
147. Stanco, Inc., New York City
148. Standard Oil Co. of Calif., San Francisco, Cal.
149. Standard Oil Co. of New Jersey, New York City
150. Stauffer Chem. Co., New York City
151. Stein-Hall & Co., Inc., New York City
152. Sun Oil Co., Philadelphia, Pa.
153. Swann Chem. Corp., Birmingham, Ala.
154. Synfleur Scientific Labs., Monticello, N. Y.
155. Texas Mining & Smelting Co., Laredo, Texas
156. Thomas, Arthur H., Co., Philadelphia, Pa.
157. Titanium Pigments Co., New York City
158. Uhlich, Paul Co., New York City
159. United Color & Pigment Co., Inc., Newark, N. J.
160. United States Gypsum Co., Chicago, Ill.
161. United States Industrial Chem. Co., Inc., New York City
162. Van-Ameringen Haebler, Inc., New York City
163. Vanderbilt, R. T. Co., Inc., New York City
164. Varcum Chem. Corp., Niagara Falls, N. Y.
165. Verley, Albert & Co., Chicago, Ill.
166. Victor Chem. Works, Chicago, Ill.
167. Virginia Smelting Co., W. Norfolk, Va.
168. Vultex Corp. of America, Cambridge, Mass.
169. Wallerstein Co., Inc., New York City
170. Welch, Holme & Clark Co., Inc., New York City
171. Whittaker, Clark & Daniels, Inc., New York City
172. Will & Baumer Candle Co., New York City
173. Wishnick-Tumpeer, Inc., New York City
174. Woburn Degreasing Co. of N. J., Harrison, N. J.
175. Wolf, Jacques & Co., Passaic, N. J.
176. Amer. Chemical Paint Co., Rochester, N. Y.
177. Baker & Co., Inc., Newark, N. J.
178. Chemical & Pigment Co., Baltimore, Md.
179. Heyden Chem. Works, New York, N. Y.
180. Kali Mfg. Co., Philadelphia, Pa.
181. Niacet Chem. Corp., Niagara Falls, N. Y.
182. Proctor & Gamble, Cincinnati, Ohio.
183. Pure Calcium Products Co., Gainesville, O.
184. Van Schaack Bros. Chem. Co., Chicago, Ill.
185. Wyodak Chem. Co., Cleveland, O.

WHERE TO BUY CHEMICALS

Abietic Acid
Hercules Powder Co., New York, N. Y.

Accelerators, Vulcanization
Rubber Service Labs., Inc., Akron, O.

Acetamide
Amer. Chemical Products Co., Rochester, N. Y.

Acetic Acid
The Cleveland-Cliffs Iron Co., Cleveland, Ohio

Acetic Anhydride
American-British Chemical Supplies, Inc., New York, N. Y.

Acetone
W. S. Gray Co., New York, N. Y.

Acetphenetidin
Merck & Co., Inc., Rahway, N. J.

Acetyl Salicylic Acid
Monsanto Chemical Co., St. Louis, Mo.

Acids, Fatty
Arthur C. Trask Co., Chicago, Ill.

Acriflavine
Abbott Laboratories, North Chicago, Ill.

Agar
American Agar Co., Inc., San Diego, Calif.

Albumen
Stein, Hall & Co., Inc., New York, N. Y.

Alcohol, Denatured
Rogers & McClellan, Boston, Mass.
L. R. Van Allen & Co., Chicago, Ill.

Alcohol, Pure
U. S. Industrial Alcohol Co., New York, N. Y.

Alkalies
Columbia Alkali Corp., New York, N. Y.

Alkaloids
Merck & Co., Inc., Rahway, N. J.

Alkanet
J. L. Hopkins & Co., New York, N. Y.

Almond Oil
Magnus, Mabee & Reynard, Inc., New York, N. Y.

Aloes
Peck & Velsor, New York, N. Y.

Alpha Naphthol
Hord Color Products, Sandusky, O.

Alumina
Aluminum Co. of America, Pittsburgh, Pa.

Aluminum
Aluminum Co. of America, Pittsburgh, Pa.

Aluminum Hydrate
Ceramic Color & Chem. Mfg. Co., New Brighton, Pa.

Alums
The Grasselli Chemical Co., Cleveland, O.

Aluminum Acetate
Niacet Chemicals Corp., Niagara Falls, N. Y.

Aluminum Bronze Powder
U. S. Bronze Powder Works, Inc., New York, N. Y.

Aluminum Chloride (Solution, Crystals and Anhydrous)
The Calco Chemical Co., Bound Brook, N. J.

Aluminum Stearate
Franks Chemical Products Co., Inc., Brooklyn, N. Y.

Aminostearin
Glyco Products Co., Inc., New York, N. Y.

Ammonia
Nat'l Ammonia Co., Inc., Philadelphia, Pa.

Ammonium Bifluoride
The Harshaw Chemical Co., Cleveland, O.

Ammonium Carbonate
Wishnick-Tumpeer, Inc., New York, N. Y.

Ammonium Chloride
Pennsylvania Salt Mfg. Co., Inc., Philadelphia, Pa.

Ammonium Linoleate
Glyco Products Co., Inc., New York, N. Y.

Ammonium Nitrate
Garrigues, Stewart & Davies, Inc., New York, N. Y.

Ammonium Oleate
Glyco Products Co., Inc., New York, N. Y.

Ammonium Persulphate
Buffalo Electro Chemical Co., Inc., Buffalo, N. Y.

Ammonium Phosphate
Swann Chemical Co., New York, N. Y.

Ammonium Sulphate
H. J. Baker & Bro., New York, N. Y.

Ammonium Stearate
Glyco Products Co., Inc., New York, N. Y.

Amyl Acetate
Chemical Solvents, Inc., New York, N. Y.

Aniline Dyes
Experimenter's Supply Co., New York, N. Y.

Aniline Oil
Dow Chemical Co., Midland, Michigan

Antimony
C. Tennant & Sons Co. of N. Y., New York, N. Y.

Antimony Chloride
Seldner & Enequist, Inc., Brooklyn, N. Y.

Antimony Oxide
O. Hommel Co., Pittsburgh, Pa.

Antimony Sulphide
Foote Mineral Co., Philadelphia, Pa.

Anti Oxidants
Givaudan-Delawanna, Inc., New York, N. Y.

Arsenic
Amer. Smelting & Refining Co., New York, N. Y.

Asbestos
Powhatan Mining Corp., Woodlawn, Baltimore, Md.

Asphalt
The Barber Asphalt Co., Philadelphia, Pa.

Asphaltum
Allied Asphalt & Mineral Corp., New York, N. Y.

Balsams
James B. Horner, Inc., New York, N. Y.

Barium Carbonate
Barium Reduction Corp., Charleston, W. Va.

Barium Nitrate
C. W. Campbell Co., Inc., New York, N. Y.

Barium Peroxide
Barium Reduction Corp., Charleston, W. Va.

Barium Sulphate
C. P. De Lore Co., St. Louis, Mo.

Barium Sulphide
Chicago Copper & Chemical Co., Blue Island, Ill.

Barytes
Bradley & Baker, New York, N. Y.
Nat'l Pigments & Chemical Co., St. Louis, Mo.

Basic Colors
Amer. Aniline Products, Inc., New York, N. Y.

Bayberry Wax
The W. H. Bowdlear Co., Syracuse, N. Y.

Beeswax
A. C. Drury & Co., Inc., Chicago, Ill.
Theodor Leonhard Wax Co., Inc., Haledon, Paterson, N. J.

Bentonite
Amer. Colloid Co., Chicago, Ill.
Silica Products Co., Kansas City, Mo.
The Wyodak Chemical Co., Cleveland, Ohio

Benzaldehyde
Heyden Chem. Corp., New York, N. Y.

Benzidine
General Aniline Works, Inc., New York, N. Y.

Benzine
Amer. Mineral Spirits Co., New York, N. Y.

Benzocaine
Abbott Laboratories, No. Chicago, Ill.

Benzoic Acid
Carus Chemical Co., Inc., La Salle, Ill.

Benzol
The Barrett Co., New York, N. Y.

Benzoyl Peroxide
Lucidol Corp., Buffalo, N. Y.

Benzyl Cellulose
Advance Solvents & Chem. Corp., New York, N. Y.

Bergamot Oil
Orbis Products Corp., New York, N. Y.

Beryllium
Belmont Smelting & Refining Wks., Inc., Brooklyn, N. Y.

Beryllium and Its Salts
Beryllium Corp. of America, New York, N. Y.

Beta Naphthol
The Calco Chemical Co., Bound Brook, N. J.

Bismuth
Cerro de Pasco Copper Corp., New York, N. Y.

Bismuth Subnitrate
The New York Quinine & Chemical Wks., Inc., Brooklyn, N. Y.

Blanc Fixe
Adolph Hurst & Co., Inc., New York, N. Y.

Bleaching Powder
Electro Bleaching Gas Co., New York, N. Y.

Blood Albumen
Morningstar, Nicol, Inc., New York, N. Y.

Bone Ash
Denver Fire Clay Co., Denver, Colorado

Bone Black
Siemon Colors, Inc., Newark, N. J.

Bone Glue
Darling & Co., Chicago, Ill.

Bone Oil
Texas Chemical Co., Houston, Texas

Borax
American Potash & Chem. Corp., New York, N. Y.

Bordeaux Mixture
Mechling Bros. Chem. Co., Camden, N. J.

Boric Acid
Borax Union, Inc., San Francisco, Calif.

Botanical Products
S. B. Penick & Co., New York, N. Y.

Bromine
J. Q. Dickinson & Co., Malden, W. Va.

Bromo-Fluorescein
Glyco Products Co., Inc., New York, N. Y.

Bronze Powder
B. K. Drakenfeld & Co., New York, N. Y.

Burgundy Pitch
Geo. H. Lincks, New York, N. Y.

Butyl Acetate
Commercial Solvents Corp., New York, N. Y.
Publicker, Inc., Philadelphia, Pa.

Butyl Aldehyde
Commercial Solvents Corp., Terre Haute, Ind.

Butyl Alcohol (Normal)
Publicker, Inc., Philadelphia, Pa.

Butyl Propionate
C. P. Chemical Solvents, Inc., New York, N. Y.

Butyric Ether
The Northwestern Chemical Co., Wauwatosa, Wisconsin

Butyl Stearate
Kessler Chem. Corp., New York, N. Y.

Cadmium
U. S. Smelting, Refining & Mining Co., New York, N. Y.

Cajuput Oil
D. W. Hutchinson & Co., New York, N. Y.

Calcium Arsenate
Bowker Chemical Corp., New York, N. Y.
Chipman Chemical Co., Inc., Bound Brook, N. J.

Calcium Carbonate
Limestone Products Corp. of Amer., Newton, N. J.

Calcium Carbonate (Precipitated)
Merck & Co., Inc., Rahway, N. J.

Calcium Chloride
Michigan Alkali Co., New York, N. Y.
Saginaw Salt Products Co., Saginaw, Mich.

Calcium Chloride (Anhydrous)
Fales Chemical Co., Inc., Cornwall Landing, N. Y.

Calcium Phosphate
Provident Chemical Wks., St. Louis, Mo.

Calcium Sulphide (Luminous)
Amer. Luminous Products Co., Huntington Park, Calif.

Calcium Stearate
The Synthetic Products Co., Cleveland, Ohio

Camphor
E. J. Barry, New York, N. Y.

Camphor Oil
Magnus, Mabee & Reynard, Inc., New York, N. Y.

Candelilla Wax
Innis, Speiden & Co., Inc., New York, N. Y.

Caramel Color
Alex Fries & Bro., Cincinnati, Ohio

Caraway Oil
Geo. Lueders & Co., New York, N. Y.

Carbolic Oil
Reilly Tar & Chemical Corp., New York, N. Y.

Carbon, Activated
The Jennison-Wright Co., Toledo, Ohio

Carbon Bisulphide
J. T. Baker Chemical Co., Phillipsburg, N. J.

Carbon Black
United Carbon Co., Charleston, W. Va.
Binney & Smith, New York, N. Y.

Carbon, Decolorizing
Darco Sales Corp., New York, N. Y.

Carbon Tetrachloride
Niagara Smelting Corp., Niagara Falls, N. Y.

Cardamom Seed
Newmann-Buslee & Wolfe, Inc., Chicago, Ill.

Carnauba Wax
Frank B. Ross Co., Inc., New York, N. Y.

Casein
The Casein Mfg. Co. of America, Inc., New York, N. Y.

Castile Soap
Conti Products Corp., New York, N. Y.

Castor Oil
The Baker Castor Oil Co., New York, N. Y.

Castor Oil, Sulphonated
Jacques Wolf & Co., Passaic, N. J.

Celluloid
Celluloid Corp., New York, N. Y.

Celluloid Scrap
Moses Serinsky Co., Indianapolis, Ind.

Cellulose Acetate
Celanese Corp. of America, New York, N. Y.

Cellulose Nitrate
Merrimac Chemical Co., Everett, Mass.

Ceresin Wax
Sherwood Petroleum Co., Inc., Brooklyn, N. Y.

Cetyl Alcohol
Hummel Chemical Co., Inc., 90 West St., New York, N. Y.

Chalk, Precipitated
Charles B. Chrystal Co., Inc., New York, N. Y.

Charcoal
Chas. L. Read & Co., Inc., New York, N. Y.
Western Charcoal Co., Chicago, Ill.

China Clay
Taintor Trading Co., New York, N. Y.

China Wood Oil
Balfour, Guthrie & Co., Ltd., New York, N. Y.

Chloramine
Abbott Laboratories, No. Chicago, Ill.

Chlorine (Liquid)
Electro Bleaching Gas Co., 9 E. 41st St., New York, N. Y.

Chloroform
The Dow Chemical Co., Midland, Michigan

Chlorophyll
Amer. Chlorophyll, Inc., New York, N. Y.
Pylam Products Co., New York, N. Y.

Cholesterin
Digestive Ferments Co., Detroit, Michigan
Merck & Co., Inc., Rahway, N. J.

Chrome Green
Kentucky Color & Chem. Co., Louisville, Ky.

Chrome Yellow
Ansbacher-Siegle Corp., Rosebank, N. Y.

Chromic Acid
Mutual Chemical Co. of America, New York, N. Y.

Chromium Oxide
O. Hommel Co., Inc., Pittsburgh, Pa.

Citral
Givaudan-Delawanna, Inc., New York, N. Y.

Citric Acid
Chas. Pfizer & Co., Inc., New York, N. Y.

Citronella Oil
H. C. Ryland, Inc., New York, N. Y.

Clay
Kentucky Clay Mining Co., Mayfield, Ky.
Olive Branch Minerals Co., Cairo, Ill.

Coal Tar
Crowley Tar Products Co., New York, N. Y.

Coal Tar Colors
H. Kohnstamm & Co., New York, N. Y.

Cobalt Acetate
Fred L. Brooke Co., Chicago, Ill.

Cobalt Driers
McGean Chemical Co., Cleveland, Ohio

Cobalt Linoleate
The McGean Chemical Co., Cleveland, Ohio

Cocoa Butter
Alpha Lux Co., Inc., New York, N. Y.
Thomas J. Shields Co., New York, N. Y.

Coconut Butter
Procter & Gamble Co., Cincinnati, Ohio

Coconut Oil
Franklin Baker Co., Hoboken, N. J.

Coconut Oil Fatty Acid
Acme Oil Corp., Chicago, Ill.

Cod Liver Oil
H. H. Rosenthal & Co., Inc., New York, N. Y.

Collodion
Charles Cooper & Co., New York, N. Y.

Colors, Dry
Holland Aniline Dye Co., Holland, Mich.

Colors, Oil Soluble
Commonwealth Color & Chem. Co., Brooklyn, N. Y.

Copper Carbonate
Chas. Copper & Co., New York, N. Y.
Jungmann & Co., Inc., New York, N. Y.

Copper Cyanide
Charles Hardy, Inc., New York, N. Y.

Copper Oxides
The O. Hommel Co., Inc., 209 Fourth Ave., Pittsburgh, Pa.

Copper Sulphate
Barada & Page, Inc., Kansas City, Mo.

Corn Oil
American Maize Products Co., New York, N. Y.

Corn Sugar
Staley Sales Corp., Decatur, Ill.

Corn Syrup
Clinton Co., Clinton, Ia.
Corn Products Refining Co., New York, N. Y.

Cottonseed Oil (Crude)
Battleboro Oil Co., Battleboro, N. C.
Welch, Holme & Clark Co., New York, N. Y.

Coumarin
Maywood Chem. Works, Maywood, N. J.

Coumarone Resin
Barrett Co., New York, N. Y.
Neville Co., Pittsburgh, Pa.

Cream of Tartar
The Harshaw Chemical Co., Cleveland, Ohio

Creosote
Koppers Products Co., Pittsburgh, Pa.

Cresols
Coopers Creek Chem. Co., W. Conshohocken, Pa.
Reilly Tar & Chemical Corp., New York, N. Y.

Cresylic Acid
The Barrett Co., New York, N. Y.

Cryolite
Vitro Mfg. Co., Pittsburgh, Pa.

Cyclohexanol
E. I. Du Pont de Nemours Co., Wilmington, Del.

Damar Gum
Geo. H. Lincks, New York, N. Y.

Degras
Amer. Lanolin Corp., Lawrence, Mass.

Derris Extract
Seacoast Laboratories, New York, N. Y.

Derris Root
W. Benkert & Co., Inc., New York, N. Y.

Dextrins
Morningstar, Nicol, Inc., New York, N. Y.

Diastase
Takamine Laboratory, Inc., Clifton, N. J.

Diatomaceous Earth
Dicalite Co., New York, N. Y.

Dibutylphthalate
The Kessler Chemical Corp., New York, N. Y.

Dichlorbenzol
Hooker Electro Chemical Co., New York, N. Y.

Diethyleneglycol
Carbide & Carbon Chemicals Corp., New York, N. Y.

Diethylphthalate
Van Dyk & Co., Inc., Jersey City, N. J.

Diglycol Oleate
Glyco Products Co., Inc., New York, N. Y.

Diglycol Laurate
Glyco Products Co., Inc., New York, N. Y.

Diglycol Stearate
Glyco Products Co., Inc., New York, N. Y.

Dioxan
Carbide & Carbon Chem. Corp., New York, N. Y.

Dipentene
Hercules Powder Co., Wilmington, Del.

Diphenyl
Swann Chemical Co., New York, N. Y.

Drop Black
Wilckes-Martin-Wilckes Co., New York, N. Y.

Dyestuffs
National Aniline & Chemical Co., Inc., New York, N. Y.

Egg, Dried
W. P. Pray, New York, N. Y.

Egg Yolk
Stein, Hall & Co., New York, N. Y.

Ephedrine
Abbott Laboratories, No. Chicago, Ill.

Epsom Salt
General Chemical Co., New York, N. Y.

Essential Oils
Compagnie Duval, New York, N. Y.

Ester Gum
John D. Lewis, Inc., Providence, R. I.
Paramet Chemical Corp., Long Island City, N. Y.

Ether
Carbide & Carbon Chemicals Corp., New York, N. Y.

Ethyl Acetate
Merrimac Chemical Co., Boston, Mass.

Ethyl Cellulose
Advance Solvents & Chem. Corp., New York, N. Y.

Ethylamine
F. C. Bersworth Labs., Framingham, Mass.

Ethyl Lactate
American Cyanamid & Chemical Corp., New York, N. Y.

Ethylene Diamine
F. C. Bersworth Labs., Framingham, Mass.

Ethylene Dichloride
Dow Chemical Co., Midland, Mich.

Ethyleneglycol
Carbide & Carbon Chemicals Corp., New York, N. Y.

Eucalyptus Oil
Chas. Fishbeck Co., New York, N. Y.

Feldspar
Consolidated Feldspar Corp., Trenton, N. J.

Fillers
C. K. Williams & Co., Easton, Pa.

Film Scrap
Horn-Jefferys & Co., Burbank, Calif.

Fish Glue
C. B. Hewitt & Bro., New York, N. Y.

Fish Oil
Falk & Co., Pittsburgh, Pa.

Flaxseed
Bisbee Linseed Co., Philadelphia, Pa.

Fluorspar
Hillside Fluor Spar Mines, Chicago, Ill.

Formic Acid
Victor Chem. Works, Chicago, Ill.

Formaldehyde
Heyden Chemical Corp., New York, N. Y.

Fuller's Earth
L. A. Salmon & Bro., New York, N. Y.
Sinclair Refining Co., Olmstead, Ill.

Fusel Oil
Empire Distilling Corp., New York, N. Y.

Gallic Acid
Eastman Kodak Co., Rochester, N. Y.

Gamboge
Frank B. Ross Co., New York, N. Y.

Gelatin
Atlantic Gelatine Co., Woburn, Mass.

Geraniol
Kay-Fries Chem., Inc., New York, N. Y.

Geranium Lake
Interstate Color Co., Inc., New York, N. Y.
R. F. Revson Co., New York, N. Y.

Geranium Oil
Schimmel & Co., New York, N. Y.

Gilsonite
George H. Lincks, New York, N. Y.
Utah Gilsonite Co., St. Louis, Mo.

Ginseng
C. H. Lewis & Co., New York, N. Y.

Glandular Products
The Wilson Laboratories, Chicago, Ill.

Glauber Salt
Iowa Soda Products Co., Council Bluffs, Ia.

Glue
Cudahy Packing Co., Chicago, Ill.

Glycerin
Colgate-Palmolive-Peet Co., Chicago, Ill.

Glyceryl Mono Stearate
Glyco Products Co., Inc., New York, N. Y.

Glyceryl Phthalate
Glyco Products Co., Inc., New York, N. Y.

Glyceryl Stearate
Glyco Products Co., Inc., New York, N. Y.

Glycol Oleate
Glyco Products Co., Inc., New York, N. Y.

Glycol Phthalate
Glyco Products Co., Inc., New York, N. Y.

Glycol Stearate
Glyco Products Co., Inc., New York, N. Y.

Gold Chloride
Mallinckrodt Chemical Works, St. Louis, Mo.

Graphite
Adolphe Hurst & Co., Inc., New York, N. Y.
Asbury Graphite Mills, Asbury Park, N. J.

Gum Arabic
T. M. Duche & Sons, New York, N. Y.

Gum Benzoin
Peek & Velsor, Inc., New York, N. Y.

Gum Copal
George H. Lincks, New York, N. Y.

Gum Damar
Thurston & Braidich, New York, N. Y.

Gum Karaya
Frank-Vliet Co., Inc., New York, N. Y.

Gum, Locust Bean
Innis, Speiden Co., New York, N. Y.

Gum Manila
Stroock & Wittenberg Corp., New York, N. Y.

Gum Tragacanth
E. Meer & Co., Inc., New York, N. Y.
J. L. Hopkins & Co., New York, N. Y.

Gypsum
U. S. Phosphoric Prod. Corp., New York, N. Y.

Hemlock Bark
Tanners Supply Co., Grand Rapids, Mich.

Henna Leaves
S. B. Penick & Co., New York, N. Y.

Herbs
John Clarke & Co., New York, N. Y.

Hexamethylenetetramine
Heyden Chemical Corp., New York, N. Y.

Hydrochloric Acid
General Chemical Co., New York, N. Y.

Hydrogen Peroxide
The Warner Chemical Co., New York, N. Y.

Hydroquinone
Eastman Kodak Co., Rochester, N. Y.

Ichthyol
Merck & Co., Rahway, N. J.

Indigo
L. E. Ransom Co., New York, N. Y.

Indium
Belmont Smelting & Refining Works, Brooklyn, N. Y.

Invert Sugar
Nulomoline Co., New York, N. Y.

Iodine
New York Quinine & Chemical Wks., Inc., Brooklyn, N. Y.

Iridium
Baker & Co., Inc., Newark, N. J.

Irish Moss
S. B. Penick & Co., New York, N. Y.

Iron Ammonium Citrate
Schuylkill Chem. Co., Philadelphia, Pa.

Iron Chloride
Chicago Copper & Chem. Co., Blue Island, Ill.

Iron Oxide
Binney & Smith Co., New York, N. Y.

Isopropyl Acetate
A. K. Hamilton, New York, N. Y.

Isopropyl Alcohol
Carbide & Carbon Chemicals Corp., New York, N. Y.

Insect Wax, Chinese
Frank B. Ross Co., Inc., New York, N. Y.

Ivory Black
Binney & Smith Co., New York, N. Y.

Japan Wax
Smith & Nichols, Inc., New York, N. Y.

Kerosene
Colonial Beacon Oil Co., Everett, Mass.

Kerosene, Deodorized
Sherwood Petroleum Co., Brooklyn, N. Y.

Laboratory Equipment
Central Scientific Co., Chicago, Ill.
Chemical Publ. Co. of N. Y., Inc., New York, N. Y.
Chicago Apparatus Co., Chicago, Ill.
Eimer & Amend, New York, N. Y.
Experimenter's Supply Co., New York, N. Y.
Fisher Scientific Co., Pittsburgh, Pa.
N. J. Laboratory Supply Co., Newark, N. J.
Scientific Glass Apparatus Co., Bloomfield, N. J.

Lacquers
Maas & Waldstein, Newark, N. J.

Lactic Acid
Apex Chemical Co., Inc., New York, N. Y.

Lamp Black
Binney & Smith Co., New York, N. Y.
L. Martin Co., New York, N. Y.

Lanolin
American Lanolin Corp., Lawrence, Mass.
Merck & Co., Inc., Rahway, N. J.
Pfaltz & Bauer, New York, N. Y.

Lard Oil
Enterprise Animal Oil Co., Philadelphia, Pa.

Lauryl Alcohol and Sulphonate
E. I. Du Pont de Nemours & Co., Wilmington, Del.

Lavender Oil
Van Ameringen-Haebler, Inc., New York, N. Y.

Lead Acetate
National Lead Co., New York, N. Y.

Lead Arsenate
Barada & Page, Inc., Kansas City, Mo.
General Chemical Co., New York, N. Y.

Lead and Its Oxides
The Eagle-Picher Sales Co, Cincinnati, Ohio

Lecithin
American Lecithin Corp., New York, N. Y.

Lemon Juice, Concentrated
Mutual Citrus Products Co., Anaheim, Calif.

Lemon Oil
D. W. Hutchinson & Co., Inc., New York, N. Y.

Licorice
MacAndrews & Forbes Co., New York, N. Y.

Lime
J. E. Baker Co., York, Pa.
Chazy Marble Lime Co., Inc., Chazy, N. Y.

Limestone
F. E. Schundler & Co., Joliet, Ill.

Linoleic Acid
Glyco Products Co., Inc., New York, N. Y.

Linseed Oil
Bisbee Linseed Co., Philadelphia, Pa.

Litharge
The Eagle-Picher Lead Co., Cincinnati, Ohio

Lithopone
Krebs Pigment & Color Corp., Newark, N. J.
Marshall Dill Co., San Francisco, Calif.

Locust Bean Powder
T. M. Duche & Sons, New York, N. Y.

Logwood Extract
American Dyewood Co., New York, N. Y.

Lycopodium
McKesson & Robbins, Inc., New York, N. Y.

Magnesia
Philip Carey Co., Lockland, O.

Magnesite
General Magnesite & Magnesia Co., Philadelphia, Pa.

Magnesium Carbonate
Merck & Co., Inc., Rahway, N. J.

Magnesium Chloride
Wishnick-Tumpeer, Inc., New York, N. Y.

Magnesium Powder
Belmont Smelting & Refining Wks., Inc., Brooklyn, N. Y.

Maleic Acid
Nat'l Aniline & Chem. Wks., New York, N. Y.

Manganese
Ajax Metal Co., Philadelphia, Pa.

Marble Dust
Hammil & Gillespie, Inc., New York, N. Y.

Manganese Dioxide
B. F. Drakenfeld & Co., Inc., New York, N. Y.

Menhaden Oil
Robert Badcock & Co., New York, N. Y.

Menthol
Chas. L. Huisking & Co., Inc., New York, N. Y.

Mercury
Chas. L. Huisking & Co., Inc., New York, N. Y.
George Uhe Co., New York, N. Y.

Methanol
Wm. S. Gray & Co., New York, N. Y.

Methyl Acetate
Carbide & Carbon Chem. Corp., New York, N. Y.

Methyl Acetone
Delta Chem. & Iron Co., Wells, Mich.

Methyl Anthranilate
Florasynth Laboratories, New York, N. Y.

Methyl p-*Hydroxybenzoate*
Heyden Chemical Corp., New York, N. Y.

Methyl Salicylate
Dow Chemical Co., Midland, Michigan

Mica
Southern Mica Co., Franklin, N. C.

Milk Sugar
Mallinckrodt Chemical Wks., St. Louis, Mo.

Mineral Rubber
Barber Asphalt Co., Philadelphia, Pa.

Mineral Spirits
Amer. Mineral Spirit Co., New York, N. Y.

Montan Wax
Strahl & Pitsch, New York, N. Y.

Naphtha
Deep Rock Oil Corp., Chicago, Ill.

Naphthalene
The Barrett Co., New York, N. Y.

Naphthenic Acid
Glyco Products Co., Inc., New York, N. Y.

Neatsfoot Oil
National Oil Products Co., Harrison, N. J.

Nickel Chloride
Chas. Cooper & Co., New York, N. Y.

Nickel Sulphate
The Harshaw Chemical Co., Cleveland, O.

Nicotine
Tobacco By-Products & Chemical Corp., Louisville, Ky.

Nicotine Sulphate
Lattimer-Goodwin Chemical Co., Grand Junction, Colo.

Nitre Cake
Trojan Powder Co., Allentown, Pa.

Nitric Acid
Monsanto Chemical Co., St. Louis, Mo.

Nitrobenzol
Calco Chem. Co., Bound Brook, N. J.

Nitrocellulose
E. I. Du Pont de Nemours & Co., Inc., Parlin, N. J.

Ochres
Smith Chemical & Color Co., Brooklyn, N. Y.

Oil, Citronella
D. W. Hutchinson & Co., Inc., New York, N. Y.

Oil, Mineral
Standard Oil Co. of California, San Francisco, Calif.

Oil, Olive
Leghorn Trading Co., Inc., New York, N. Y.

Oiticica Oil
L. N. Jackson & Co., New York, N. Y.

Olein
Century Stearic Acid Wks., New York, N. Y.

Oleoresins
Seeley & Co., New York, N. Y.

Olive Oil, Sulphonated
Royce Chem. Co., Carlton Hill, N. J.

Orange Oil
Dodge & Olcott Co., New York, N. Y.

Ortho Dichlorbenzene
Hooker Electrochemical Co., New York, N. Y.

Oxalic Acid
Mutual Chemical Co. of America, New York, N. Y.

Oxgall
Wilson Labs., Chicago, Ill.

Oxygen
Cheney Chemical Co., Cleveland, O.

Oxyguinoline Sulphate
Benzol Products Co., Newark, N. J.

Ozokerite Wax
Strohmeyer & Arpe Co., New York, N. Y.

Palm Kernel Oil
Franklin Baker Co., Hoboken, N. J.

Palm Oil
Wishnick-Tumpeer, Inc., New York, N. Y.

Paraffin Oils
S. Schwabacher & Co., Inc., New York, N. Y.

Paraffin Wax
Oil States Petroleum Co., New York, N. Y.

Paraldehyde
Heyden Chem. Corp., New York, N. Y.

Para Aminophenol
Verona Chem Co., Newark, N. J.

Para-Phenylenediamine
Amido Products Co., New York, N. Y.

Paris White
Southwark Mfg. Co., Camden, N. J.

Peanut Oil
Elbert & Co., New York, N. Y.

Pearl Essence
Mearl Corp., New York, N. Y.

Pectin
Calif. Fruit Growers' Exchange, Ontario, Calif.

Peppermint Oil
Magnus, Mabee & Reynard, Inc., New York, N. Y.
The Sparhawk Co., Sparkhill, N. Y.

Perilla Oil
S. L. Jones & Co., San Francisco, Calif.

Petrolatum
Pennsylvania Refining Co., Butler, Pa.

Petroleum Jelly
L. Sonneborn Sons, Inc., New York, N. Y.

Petroleum Spirits
Sun Oil Co., Philadelphia, Pa.

Phenol
American-British Chemical Supplies, Inc., New York, N. Y.

Phenol-Formaldehyde Resins
Durite Plastics, Philadelphia, Pa.

Phosphoric Acid
Victor Chemical Works, Chicago, Ill.

Phosphorus
International Selling Corp., New York, N. Y.

Phthalic Anhydride
Monsanto Chem. Co., St. Louis, Mo.

Pine Oil
General Naval Stores Co., Inc., New York, N. Y.

Pine Tar
Southern Pine Chem. Co., Jacksonville, Fla.

Pitch
Robert Rauh, Inc., Newark, N. J.

Plaster of Paris
Whittaker, Clark & Daniels, Inc., New York, N. Y.

Potash, Caustic
Niagara Alkali Co., New York, N. Y.

Potassium Carbonate
Joseph Turner & Co., New York, N. Y.

Potassium Chlorate
Joseph Turner & Co., New York, N. Y.

Potassium Hydroxide
Merck & Co., Inc., Rahway, N. J.

Potassium Iodide
New York Quinine & Chemical Wks., Inc., Brooklyn, N. Y.

Potassium Oleate
Glyco Products Co., Inc., New York, N. Y.
Carl F. Miller & Co., Seattle, Washington

Potassium Permanganate
Carus Chemical Co., Inc., La Salle, Ill.

Potassium Silicate
Philadelphia Quartz Co., Philadelphia, Pa.

Prussian Blue
Kentucky Color & Chem. Co., Louisville, Ky.

Pumice
Charles B. Crystal Co., New York, N. Y.

Psyllium Seeds
Laxseed Co., New York, N. Y.

Pyrethrum Extract
McLaughlin, Gormley, King & Co., Minneapolis, Minn.

Pyrethrum
S. B. Penick & Co., New York, N. Y.

Pyrogallic Acid
Zinsser & Co., Inc., Hastings-on-Hudson, N. Y.

Pyroxylin Solutions
Egyptian Lacquer, Kearney, N. J.

Quince Seed
J. L. Hopkins & Co., New York, N. Y.

Quinine Bisulphate
R. W. Greef & Co., Inc., New York, N. Y.

Rapeseed Oil
Balfour, Guthrie & Co., Ltd., New York, N. Y.

Red Oil
Century Stearic Acid Candle Wks., New York, N. Y.

Resins, Synthetic
Beck, Koller & Co., Inc., Detroit, Mich.
Marshall Dill, San Francisco, Calif.

Resorcin
Penn. Coal Products Co., Petrolia, Pa.

Rhodium
Baker & Co., Inc., Newark, N. J.

Rochelle Salts
Chas. Pfizer & Co., Inc., New York, N. Y.

Rose Water
Geo. Lueders & Co., New York, N. Y.

Rosin
General Naval Stores Co., Inc., New York, N. Y.

Rosin Oil
National Rosin Oil & Size Co., New York, N. Y.

Rotenone
Thorocide, Inc., St. Louis, Mo.

Rubber
Earle Bros., New York, N. Y.

Rubber Latex
Littlejohn & Co., Inc., New York, N. Y.

Saccharine
Heyden Chemical Corp., New York, N. Y.

Salicylic Acid
The Dow Chemical Co., Midland, Mich.

Sal Soda
Church & Dwight Co., Inc., New York, N. Y.

Salt
Morton Salt Co., Chicago, Ill.

Salt Cake
Amer. Cyanamid & Chem. Corp., New York, N. Y.

Saltpetre
Croton Chem. Corp., Brooklyn, N. Y.

Saponin
Experimenters Supply Co., New York, N. Y.
Jungmann & Co., New York, N. Y.

Selenium
Amer. Metal Co., New York, N. Y.

Shellac
Wm. Zinsser & Co., New York, N. Y.

Shellac Wax
Adolphe Hurst & Co., New York, N. Y.

Siennas
Fezandie & Sperrie, Inc., New York, N. Y.

Silica
Barnsdall Tripoli Corp., Seneca, Mo.

Silver
Handy & Harman, New York, N. Y.

Silver Cyanide
Chas. Cooper & Co., New York, N. Y.

Silver Nitrate
Eastman Kodak Co., Rochester, N. Y.

Soda Ash
Diamond Alkali Co., Pittsburgh, Pa.

Soda, Caustic
Mathieson Alkali Works, Inc., New York, N. Y.

Soda, Sal
Consolidated Chem. Sales Corp., Newark, N. J.

Sodium Aluminate
National Aluminate Corp., Chicago, Ill.

Sodium Arsenite
Harrison Mfg. Co., Rahway, N. J.

Sodium Benzoate
Hooker Electrochemical Co., New York, N. Y.

Sodium Bicarbonate
Church & Dwight Co., Inc., New York, N. Y.

Sodium Bichromate
Prior Chem. Corp., New York, N. Y.

Sodium Bisulphite
The Grasselli Chemical Co., Cleveland, Ohio

Sodium Carbonate
Solvay Sales Corporation, New York, N. Y.

Sodium Choleate
Difco Laboratories, Inc., Detroit, Mich.

Sodium Cyanide
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.

Sodium Fluoride
American Cyanamid & Chemical Corp., New York, N. Y.

Sodium Hydrosulphite
Royce Chemical Co., Carlton Hill, N. J.

Sodium Hydroxide
Merck & Co., Inc., Rahway, N. J.

Sodium Hypochlorite
Delta Chemical Mfg. Co., Baltimore, Md.
Mathieson Alkali Wks., Inc., New York, N. Y.

Sodium Hypochlorite Liquid
Riverside Chemical Co., No. Tonawanda, N. Y.

Sodium Hyposulphite
The Grasselli Chemical Co., Cleveland, Ohio

Sodium Metaphosphate
Buromin Co., Pittsburgh, Pa.

Sodium Metasilicate
Philadelphia Quartz Co., Philadelphia, Pa.

Sodium Nitrate
Battelle & Renwick, New York, N. Y.

Sodium Nitrite
Solvay Sales Corp., New York, N. Y.

Sodium Perborate
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.

Sodium Phosphate
Swann Chemical Co., New York, N. Y.

Sodium Resinate
Paper Makers Chem. Corp., Wilmington, Del.

Sodium Silicate
Mechling Bros. Chemical Co., Camden, N. J.
Philadelphia Quartz Co., Philadelphia, Pa.
Standard Silicate Co., Pittsburgh, Pa.

Sodium Silico Fluoride
The Grasselli Co., Cleveland, Ohio

Sodium Sulphate
General Chem. Co., New York, N. Y.

Sodium Stannate
Harshaw Chem. Co., Cleveland, Ohio

Sodium Sulphite
Mechling Bros. Chemical Co., Camden, N. J.

Sodium Tungstate
J. T. Baker Chem. Co., Phillipsburg, N. J.

Solvent Naphtha
Barrett Co., New York, N. Y.

Sorbitol
Atlas Powder Co., Wilmington, Del.

Soybean Oil
Spencer Kellogg & Sons Sales Corp., Buffalo, N. Y.
Arthur C. Trask Co., Chicago, Ill.

Sperm Oil
Cook Swan Co., Inc., New York, N. Y.

Spermaceti
Strahl & Pitsch, New York, N. Y.

Squill
S. B. Penick & Co., New York, N. Y.

Starch
Starch Products Co., New York, N. Y.

Stearic Acid
Century Stearic Acid Candle Wks., New York, N. Y.

Stearin
M. Werk Co., Cincinnati, Ohio

Stearine Pitch
A. Gross & Co., New York, N. Y.

Strontium Nitrate
Grasselli Chem. Co., Cleveland, Ohio

Strychnine
Chas. Pfizer & Co., New York, N. Y.

Sulphonated Castor Oil
Burkard-Schier Chem. Co., Chattanooga, Tenn.

Sulphonated Olive Oil
Jacques Wolf & Co., Passaic, N. J.

Sulphur
Stauffer Chemical Co. of Texas, Freeport, Tex.

Sulphur Dioxide
Virginia Smelting Co., Boston, Mass.

Sulphuric Acid
Merrimac Chemical Co., Everett Sta., Boston, Mass.

Talc
Charles B. Crystal Co., Inc., New York, N. Y.

Tallow
Welch, Holme & Clark Co., Inc., New York, N. Y.

Tartaric Acid
R. W. Greeff & Co., Inc., New York, N. Y.

Tar Acid Oil
Barrett Co., New York, N. Y.

Tartar Emetic
Apex Chem. Co., New York, N. Y.

Tea Seed Oil
Lundt & Co., New York, N. Y.

Terpineol
D. W. Hutchinson & Co., New York, N. Y.

Tetrachlorethane
Dow Chemical Co., Midland, Mich.

Tetrachlorethylene
E. I. Du Pont de Nemours & Co., Wilmington, Del.

Thallium Sulphate
Jungmann & Co., Inc., New York, N. Y.

Thiocarbamilid
Monsanto Chemical Co., St. Louis, Mo.

Thiourea
Jungmann & Co., New York, N. Y.

Thymol
Sherka Chemical Co., Inc., Bloomfield, N. J.

Tin
Union Smelting & Refining Co., Inc., Newark, N. J.

Tin Chloride
Seldner & Enequist, Inc., Brooklyn, N. Y.

Tin Oxide
McGean Chemical Co., Cleveland, Ohio

Tinctures
Parke, Davis & Co., Detroit, Mich.

Titanium Dioxide
Marshall Dill, San Francisco, Calif.
R. T. Vanderbilt Co., New York, N. Y.

Toluol
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

Triacetin
Niacet Chemicals Corp., Niagara Falls, N. Y.

Tricresyl Phosphate
R. W. Greeff & Co., Inc., New York, N. Y.

Triethanolamine
Experimenter's Supply Co. (small lots), New York, N. Y.
Carbide & Carbon Chem. Co. (large lots), New York, N. Y.

Triethanolamine Oleate
Glyco Products Co., Inc., New York, N. Y.
Marshall Dill Co., San Francisco, Calif.

Triethanolamine Stearate
Glyco Products Co., Inc., New York, N. Y.
Carl F. Miller & Co., Seattle, Washington

Triphenylquanadine
E. I. Du Pont de Nemours & Co., Wilmington, Del.

Triphenylphosphate
Monsanto Chemical Co., St. Louis, Mo.

Tripoli
Tamms Silica Co., Chicago, Ill.

Tungsten
Fansteel Products Co., No. Chicago, Ill.

Turkey Red Oil
National Oil Products Co., Inc., Harrison, N. J.

Turpentine
Antwerp Naval Stores Co., Inc., Boston, Mass.
General Naval Stores Co., New York, N. Y.

Turpentine Substitute
Anderson-Prichard Oil Corp., Oklahoma City, Okla.

Turpentine (Venice)
National Rosin Oil & Size Co., New York, N. Y.

Turtle Oil
Edwin Seebach Co., New York, N. Y.

Ultramarine Blue
Standard Ultramarine Co., Huntington, W. Va.

Umbers
Fezandie & Sperrle, Inc., New York, N. Y.

Uranium Nitrate
Harshaw Chemical Co., Cleveland, Ohio

Urea
Sherka Chemical Co., Inc., Bloomfield, N. J.

Vanilla Beans
Thurston & Braidich, New York, N. Y.

Vanillin
Seeley & Co., Inc., New York, N. Y.
Van Ameringen-Haebler, Inc., New York, N. Y.

Varnish Gums and Resins
Amer. Cyanamid & Chem. Corp., New York, N. Y.

Vat Colors
Amer. Aniline Products, Inc., New York, N. Y.

Vegetable Colors
L. E. Ransom Co., New York, N. Y.

Vermiculite
Hill Bros. Chem. Co., Los Angeles, Calif.

Vermilion
Fezandié & Sperrlé, Inc., New York, N. Y.

Vinyl Acetate
Niagara Chemicals Corp., Niagara Falls, N. Y.

Vinyl Chloride
Carbide & Carbons Chem. Corp., New York, N. Y.

Wax, Synthetic
Glyco Products Co., Inc., New York, N. Y.

Wetting Out Agents
Glyco Products Co., Inc., New York, N. Y.

Whiting
Columbia Alkali Corp., New York, N. Y.
Limestone Products Corp. of America, Newton, N. J.

Witch Hazel Extract
E. E. Dickinson Co., Essex, Conn.

White Arsenic
H. H. Rosenthal Co., New York, N. Y.

White Lead
National Lead Co., New York, N. Y.

Wood Flour
D. H. Litter Co., New York, N. Y.
Wood Flour, Inc., Manchester, N. H.

Xylol
The Barrett Co., New York, N. Y.

Yeast
Standard Brands, Inc., New York, N. Y.

Zinc
Hegeler Zinc Co., Danville, Ill.

Zinc Carbonate
Wishnick-Tumpeer, Inc., New York, N. Y.

Zinc Chloride
Wishnick-Tumpeer, Inc., New York, N. Y.

Zinc Chromate
E. M. & F. Waldo, Inc., Muirkirk, Md.

Zinc Oxide
Merck & Co., Inc., Rahway, N. J.
N. J. Zinc Co., New York, N. Y.

Zinc Stearate
Merck & Co., Inc., Rahway, N. J.
Wishnick-Tumpeer, Inc., New York, N. Y.

Zinc Sulphate
W. R. Russell & Co., New York, N. Y.
Virginia Smelting Co., West Norfolk, Va.

Zirconium Oxide
Foote Mineral Co., Philadelphia, Pa.

FOREIGN SUPPLIERS OF SPECIALTY CHEMICALS

Great Britain
- Rex Campbell Co., Ltd., 7 Idol Lane, Eastcheap, London E.C. 3
- Stafford Allen & Sons, Ltd., Cowper St., Finsbury, London E.C. 2
- A. Boake Roberts Co., Ltd., Carpenters Rd., Stratford, London E. 15
- British Drug Houses, Ltd., Regis House, King William St., London E.C. 4
- P. Samuelson & Co., London.

France
- Generale Industrielle, 22 Avenue de la Grande Armée, (17) Paris
- Arnault & Vanderdonek, 41 Rue de Liège, (8) Paris
- Edmond Tyberghein & Co., 42 Rue Vignon, (9) Paris
- W. Van Lede, 176 Blvd. Voltaire, Asnières, Seine
- R. S. Stokvis & Fils, 20–22 Rue de Petits Hotel, (10) Paris
- Etablissements Kuhlmann, 11 Rue de la Baume, (11) Paris
- Deroy Fils Ainé, 71–77 Rue de Théâtre, Paris

Canada
- Canada Colors & Chemicals, Ltd., 1090 King St. W., Toronto, 2
- R. C. Loane, 512 McGill St., Montreal
- Canadian Industries, Ltd., Toronto
- Chas. Tennant & Co. (Canada), Ltd., 372 Bay St., Toronto
- Merck & Co., Ltd., Montreal and Toronto
- Shawinigan Chemicals, Ltd., Power Bldg., Montreal
- British Drug Houses (Canada), Ltd., Terminal Warehouses, Toronto
- Shanahan Chemicals, Ltd., Ft. of Campbell Ave., Vancouver, B. C.
- Chemicals, Ltd., 384 St. Paul's St. W., Montreal

India
- Purshotamdass Popatlal & Co., 37 Hamam St., Fort, Bombay
- Imperial Chemical Industries (India), Ltd., Imperial Chemical House, Ballard Estate, Bombay
- Ciba (India), Ltd., Post Box 479, Bombay

Holland
- N. V. Chemische Fabriek Servo, Delden (Twente), Holland
- W. A. Scholten's Chemical Works, Ltd., Groningen, Holland

Australia and New Zealand
- Robert Bryce & Co., Pty. Ltd.:
  - 526–32 Little Bourke St., Melbourne
  - 27 Chesser St., Adelaide
  - 414 Kent Ave., Sidney
  - 19 Lower Tory St., Wellington, New Zealand

Japan
- Dr. Justus Wolff, Miyamoto-Dori, 6-Chome, No. 52 of 2, Kobe, Japan

Argentine
- W. H. Goetz, Calle Sarandi 315, Buenos Aires

Cuba
- J. M. Sierra, Aquiar 73 Dpt. 710, Apartado 363. Havana

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COMBINED INDEX

FOR

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